



Precision Strike Annual Programs Review



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**10 - 11 March 2009
Fort Walton Beach, FL**

Tuesday, 10 March 2009

OPENING REMARKS:

Major General David W. Eidsaune, USAF—Commander, Air Armament Center and Air Force Program Executive Officer for Weapons, Eglin AFB

NEW ADMINISTRATION & TECHNOLOGIES—INDUSTRY'S PERSPECTIVE ON CHANGES FOR PRECISION STRIKE

*Douglas Young— Vice President for Business Development, Strike and Surveillance Systems Division ,
Northrop Grumman Corporation*

JOINT STRATEGIC PLANNING SYSTEM:

Jay Rouse— Senior Policy Analyst supporting the Joint Staff in J-5 Deputy Directorate for Strategic Plans and Policy

WEAPONS TECHNOLOGYPROJECTS & ROADMAP:

Colonel Kirk Kloeppe, USAF—Director, Munitions Directorate, Eglin AFB

PRECISION STRIKE—AN OSD PERSPECTIVE:

Keith Sanders—Deputy Director, Portfolio Systems Acquisition (Air Warfare), Office of the Deputy Under Secretary of Defense (Acquisition and Technology).

USAF GUNSHIP PRECISION ENGAGEMENT OPERATIONS—SPECIAL OPERATIONS IN THE KILL CHAIN:

Lieutenant Colonel Brenda Cartier, USAF—Commander, 4 SOS, Air Force Special Operations Command, Hurlburt Field

Wednesday, 11 March 2009

ACQUISITION STRATEGIES FOR C4ISR:

Timothy J. Harp—Deputy Assistant Secretary of Defense (C3ISR & IT Acquisition), NII/CIO, OSD

ARMY'S FUTURE PRECISION STRIKE WEAPONS SYSTEMS:

- **Small Guided Munitions—Path Ahead**
Steven L. Borden—Deputy PM, Small Guided Munitions, Joint Attack Munition Systems Project Office
- **Guided Multiple Launch Rocket System (GMLRS)—An Alternative Warhead to address the DPICM Target Set**
Colonel Dave Rice, USA—PM, Fires-Rockets & Missiles
- **Precision Strike Suite—Special Operations Forces (PSS-SOF)**
LtCol Benjamin Greiner, USA—TCM FSC3, Fort Sill
- **EXCALIBUR and Precision Guidance Kit—Update on Precision Artillery Munitions**
Colonel Ole Knudson, USA—PM for Combat Ammunition Systems

F-35—JOINT STRIKE FIGHTER PROGRAM:

Captain John K. Martins, USN—Director, Air Vehicle, F-35 Lightning II Program Office

FLEXIBILITYOUR PRECISION WEAPONS BRING TO THE FIGHT:

Dr. Bruce Simpson—Director, 308th Armament Systems Wing, Eglin AFB

- 0700 **REGISTRATION / BUFFET BREAKFAST**
(Sponsored by Orbital Sciences Corp.)
- 0800 **ANNUAL REVIEW WELCOME:**
Bill Dalecky—Chairman of the Board, Precision Strike Association
- 0805 **EVENT CHAIR WELCOME:**
Lieutenant Colonel Kenneth Britt, USA (Ret)—Senior Analyst for Precision Strike Division, Headquarters, U.S. Army
- 0810 **OPENING REMARKS:**
Major General David W. Eidsaune, USAF—Commander, Air Armament Center and Air Force Program Executive Officer for Weapons, Eglin AFB
- 0820 **NEW ADMINISTRATION & TECHNOLOGIES—INDUSTRY’S PERSPECTIVE ON CHANGES FOR PRECISION STRIKE**
Douglas Young—Vice President for Business Development, Strike and Surveillance Systems Division, Northrop Grumman Corporation
- 0900 **KEYNOTE ADDRESS—JOINT PRECISION ENGAGEMENT:**
Major General David M. Edgington, USAF—Chief of Staff, United States Joint Forces Command
- 0945 **NETWORKING REFRESHMENT BREAK**
- 1015 **JOINT STRATEGIC PLANNING SYSTEM:**
Jay Rouse—Senior Policy Analyst supporting the Joint Staff in J-5 Deputy Directorate for Strategic Plans and Policy
- 1100 **WEAPONS TECHNOLOGY PROJECTS & ROADMAP:**
Colonel Kirk Kloeppel, USAF—Director, Munitions Directorate, Eglin AFB
- 1145 **LUNCHEON & 13TH ANNUAL WILLIAM J. PERRY AWARD CEREMONY**
- Luncheon (Sponsored by Raytheon Co. & Northrop Grumman Corp.)
 - Presentation of William J. Perry Award to the **USSOCOM Stand Off Precision Guided Munition Quick Reaction Team**
 - Recipient’s Remarks by *Colonel James Geurts, USAF*—PEO for Fixed Wing Systems, USSOCOM
- 1315 **PRECISION STRIKE—AN OSD PERSPECTIVE:**
Keith Sanders—Deputy Director, Portfolio Systems Acquisition (Air Warfare), Office of the Deputy Under Secretary of Defense (Acquisition and Technology).
- 1410 **USE OF LASER TECHNOLOGY IN PRECISION ENGAGEMENT:**
Larry Phillips—Deputy PM for High Energy Laser Technology Demonstration Program, Army Space & Missiles Defense Command
- 1445 **NETWORKING REFRESHMENT BREAK** (Sponsored by Kaman Precision Products)
- 1515 **USAF GUNSHIP PRECISION ENGAGEMENT OPERATIONS—SPECIAL OPERATIONS IN THE KILL CHAIN:**
Lieutenant Colonel Brenda Cartier, USAF—Commander, 4 SOS, Air Force Special Operations Command, Hurlburt Field
- 1600 **INTERNATIONAL PERSPECTIVE:**
Chair: *Jim Pennock*—MBDA Missile Systems
- **Use of Precision Strike Assets within a Multinational Perspective—Challenges & Lessons:**
Lieutenant Colonel Sylvain Gagné, MSc, CD—Chief of Joint Fires and Targeting at the Multinational Regional Command South in Afghanistan APR-DEC 07
 - **Employment of Precision Weapons by the Royal Air Force:** *Wing Commander Jim Mulholland MA BSc(Hons)*
RAF Assistant Director Weapons Directorate of Equipment Capability (Deep Target Attack)
- 1730 **INFORMAL ANNUAL MEETING & EVENING RECEPTION WITH HEAVY HORS D’OEUVRES—ALL PARTICIPANTS ARE INVITED & ENCOURAGED TO ATTEND** (Sponsored by Lockheed Martin Corp.)
Bill Dalecky—Annual Meeting Chair

WEDNESDAY, 11 MARCH

- 0700 **CONTINENTAL BREAKFAST** (Sponsored by Honeywell Int'l)
- 0730 **ACQUISITION STRATEGIES FOR C4ISR:**
Timothy J. Harp—Deputy Assistant Secretary of Defense (C3ISR & IT Acquisition), NII/CIO, OSD
- 0815 **ARMY'S FUTURE PRECISION STRIKE WEAPONS SYSTEMS:**
Chair: *Lieutenant Colonel Kenneth Britt, USA (Ret)*—Precision Strike Division (DAPR-FDS), ODCS G-8 – Force Development
- **Small Guided Munitions—Path Ahead**
Steven L. Borden—Deputy PM, Small Guided Munitions, Joint Attack Munition Systems Project Office
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- 0945 **NETWORKING REFRESHMENT BREAK** (Sponsored by DRS Technologies)
- 1015 **F-35—JOINT STRIKE FIGHTER PROGRAM:**
Captain John K. Martins, USN—Director, Air Vehicle, F-35 Lightning II Program Office
- 1100 **LUNCHEON** (Sponsored by ATK)
- 1145 **LUNCHEON ADDRESS—FUTURE DIRECTION FOR INDUSTRY:**
John J. Cronin—ATK Senior Vice President & President, ATK Mission Systems
- 1230 **AIR SYNERGY WITH COALITION FORCES:**
Chair: *Colonel Bill DeMaso, USAF*—AF/A5RC
- **Overview—Advancing the Precision Team:** *Brig Gen Charles W. Lyon, USAF*
Deputy Director, Operational Capability Requirements, DCS for Operations, Plans and Requirements, Headquarters USAF
 - **A-10, F-15E, MQ-9: CAS Platform Rep**
 - **Air Ground Operations:** *Lt Col Dan Spires, USAF*—Air Combat Command, Weapons and Tactics, Langley AFB
 - **AF Special Operations:** *Craig Walker, USAF*
 - **Using Air Force Precision Fires in Afghanistan:**
 - *Lt Col Jeff Fischer, USAF*—Electronic Attack Branch Chief
 - *Lt Col André Mouton, USAF*—Wing CC Mentor/Deputy Lead, Ops Team Air Corps Advisory Group, Afghanistan
- 1400 **FLEXIBILITY OUR PRECISION WEAPONS BRING TO THE FIGHT:**
Dr. Bruce Simpson—Director, 308th Armament Systems Wing, Eglin AFB
- 1445 **CLOSING REMARKS:** *Bill Dalecky*

PRECISION STRIKE ANNUAL REVIEW COMMITTEE

PSA Programs Chair: Ginny Sniegion | **PSA Programs Vice-Chair:** CAPT Gregg "Mongo" Sears USN

Annual Review Event Chair: LTC Ken Britt USA (Ret) | **Congressional Chair:** Dick Rumpf | **International Chair:** Jim Pennock

U.S. Military Chairs: CAPT Larry Burt USN, Col Bill DeMaso USAF, COL Lance Moore USA (Ret), Col Bob Valin USAF

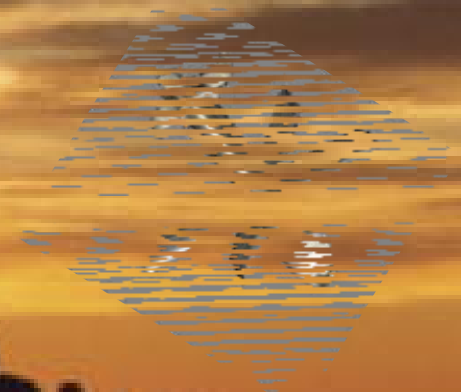
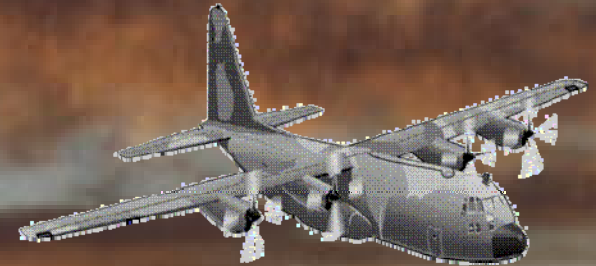
LCDR Scott Wilson USN, LTC Joe Horab USA, LtCol Chuck Kelly USMC (Ret)

Annual Meeting Chair: Bill Dalecky—PSA | **PSA Executive Director:** Dawn Campbell, CMP

Unclassified



Small Guided Munitions - Path Ahead

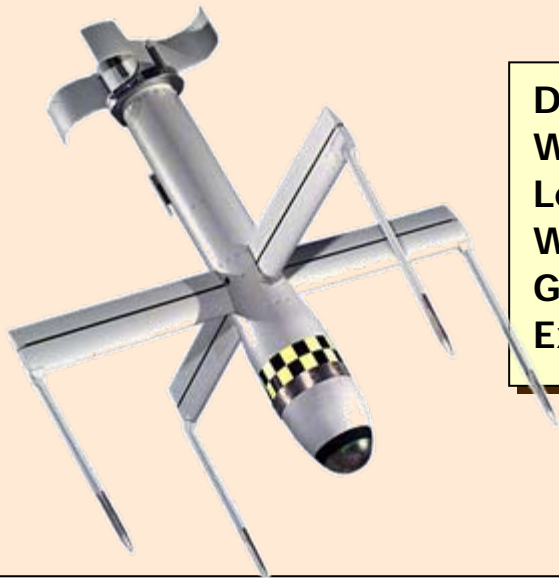


Distribution Statement A – Approved for public release; distribution is unlimited

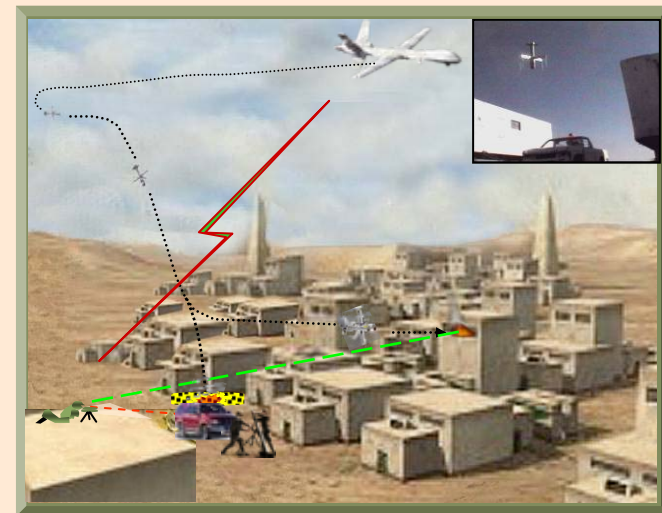
11 Mar 09

Unclassified

Viper Strike Snapshot

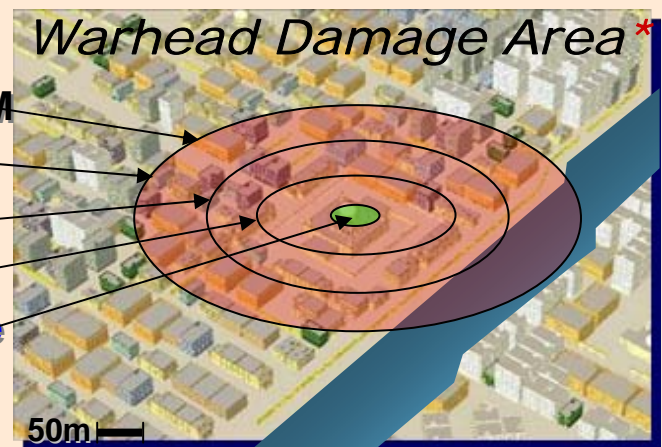


Diameter	5.5 in
Wingspan	36 in
Length	36 in
Weight	44 lb
Glide Ratio	9:1
Explosive	2.3 lb



- GPS / INS Navigation + SAL Terminal
- Precise <1m CEP
- Low Probability of Collateral Damage
- GPS Extends Glide Range to 10+km
- Agile: 360 deg. off-axis, steep/shallow, direct/indirect attack
- Key Target Set Capable
 - Personnel
 - Moving/Stationary Targets
 - Room in a Building

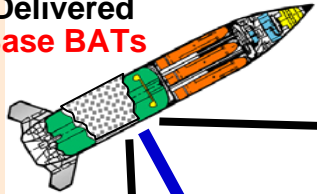
500 lb. JDAM
GBU-12
SDB (est.)
Hellfire
Viper Strike



*Joint Pub 3-09.3 Joint CAS (.1% PI)

Viper Strike Lineage

**ATACMS
Delivered
Base BATs**



**Eagle Eyes
Multi-Mode Seeker
Proof of Principle**

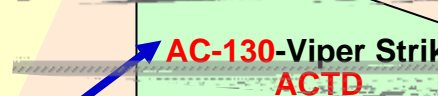


Operational Capability

**Convert Block II
Base BAT to
Viper Strike
Munitions**



**AC-130-Viper Strike
ACTD**



**New Production
Viper Strike
Munition
Requirements**

**Viper Strike
Operational Use
on
Multiple Platforms
for
Multiple Missions**

**Platform
Integration**



**Multiple Manned &
Unmanned Platform
Viper Strike Demos**



**Viper Strike SAL Seeker
Proof of Principle
Demos I & II**



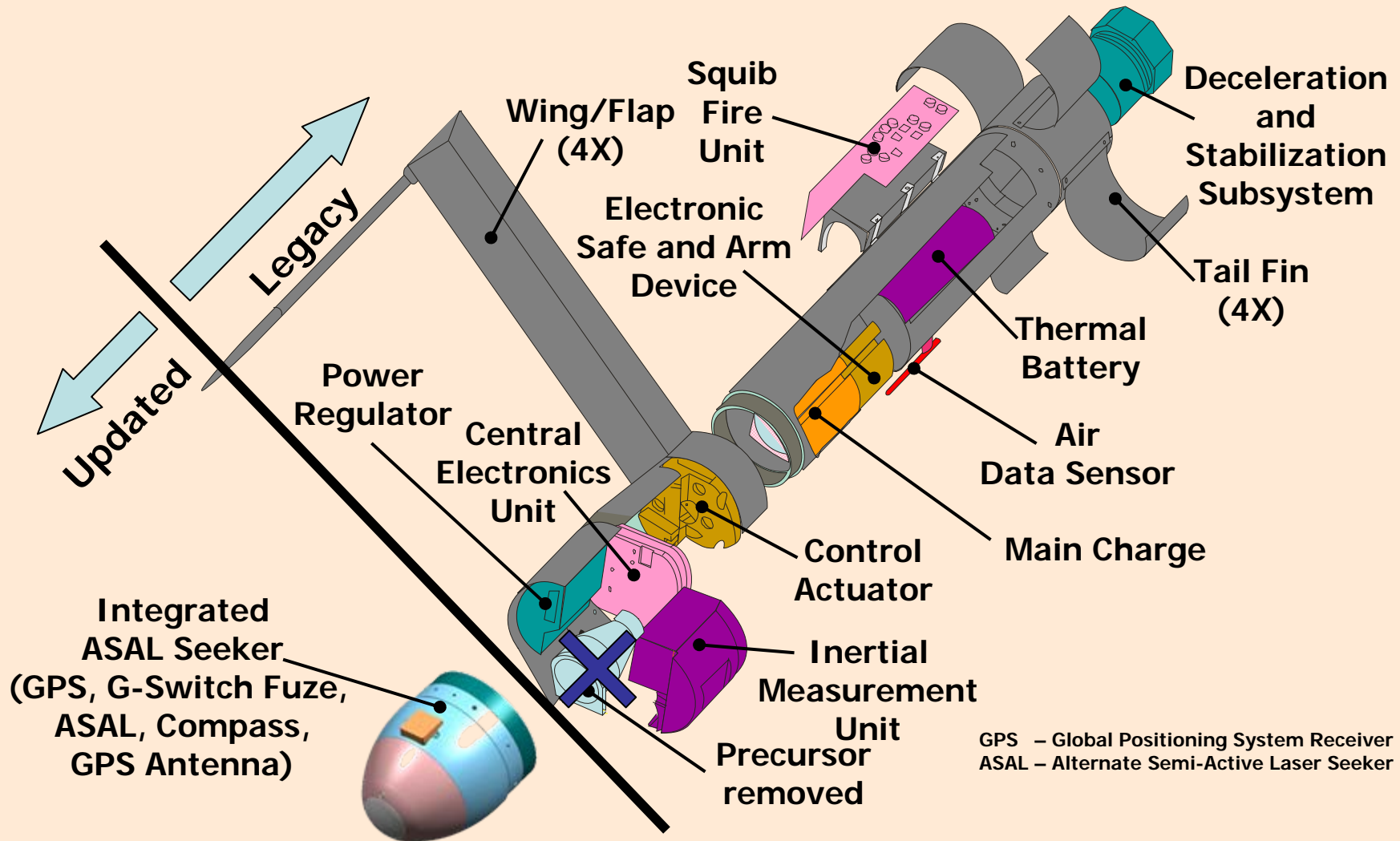
**Hunter-Viper Strike
Quick Reaction Capability
Munitions Fielded**

**Hunter - Base BAT
Demo**

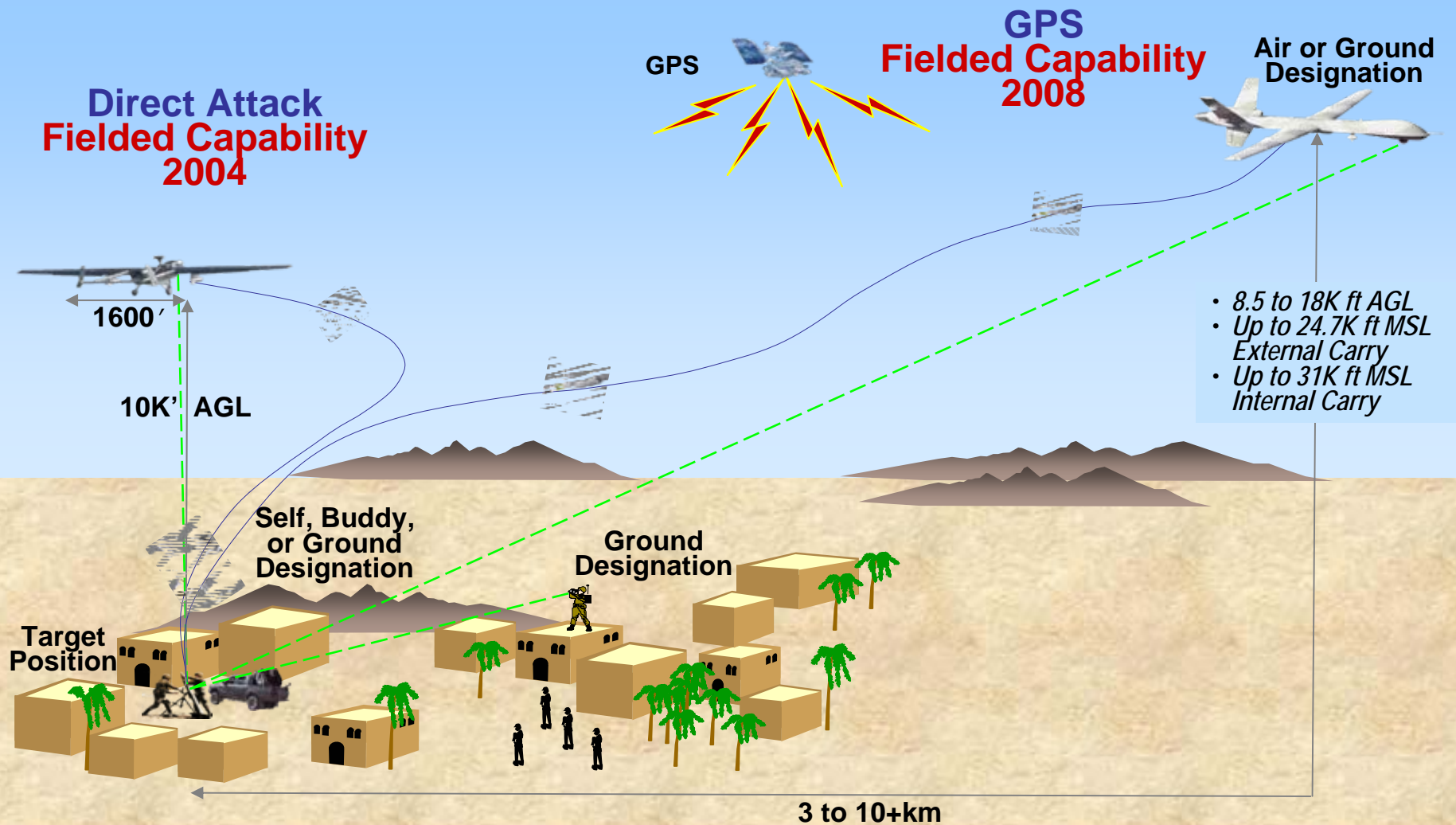


Proof of Principle

Viper Strike Subsystems



Viper Strike Variants





Viper Strike Direct Attack Capabilities



- Launch Altitudes – 8K' to 13K'
- Low Circular Error of Probability – Less than One Meter CEP
- Low Collateral Damage – 16 Meters for Urban Targets
- Top Down Blast Effect – Limits Damage in Urban Canyons
- Moving Targets – Up to 30 mph
- Danger Close – ATEC Approved at 50 Meters
- Double the Payload – Half the Weight of Hellfire
- Multiple Laser Designation Options – Air, Buddy, or Ground
- Day or Night Capability
- Stand Off – 1/2km to 1km
- Tandem shaped charge warhead for armored targets
- Only Qualified Weapon for Hunter Class UAS
- Capability Fielded in OIF – Proven & Certified
- First Weapon employed from an Army UAS in combat

Direct Attack





Viper Strike ASAL GPS Improvements

- ***ASAL GPS variant provides 360° “see and shoot” capability and significantly simplifies engagement execution versus Direct Attack VS***
- ***Provides indirect and top/shallow attack capabilities (urban CAS, ground party targeting/designation)***
- ***Increases standoff range by greater than 10 times that of Direct Attack***
- ***Adds covert capability (no observable signature)***
- ***Increases launch altitudes:
24.7K’ MSL External Carry
31K’ MSL Internal Carry***
- ***ASAL Seeker dramatically increases Field-Of-View and Detection Range***
- ***G-Switch replaces Impact Fuze Sensor for better reliability against soft targets***
- ***GPS Munition Unit Cost reduced by > 40% in 2008***
 - ***Lean Production Line Initiative eliminated many unnecessary tasks***
 - ***Alternate Domestic Suppliers found for critical components***





GPS Viper Strike





Viper Strike Missions

- ***“Golden Shots”***
 - ***Pinpoint a moving armored car in a motorcade***
- ***Restricted (Minimal Collateral Damage) Urban Targets***
 - ***Reach down into cordoned urban canyons***
 - ***Near vertical angle of attack projects warhead shrapnel into the target and ground minimizing collateral damage***
- ***Convoy & TOC ISR & Security***
 - ***At 10K' AGL, UAVs relatively unseen, unheard, and undetectable***
 - ***Allows observation of enemy preparations, IED placement, and ambush points***
- ***Key Infrastructure ISR & Armed Response***
 - ***Refineries, pipelines, politically sensitive locations, etc.***
- ***Monitor critical situations with timely response***
 - ***Undetected observation without ground troops in harm's way***
- ***(GPS) Extended Stand-off Range Attack***
 - ***Up to and beyond organic sensor range***
- ***(GPS) Close Air Support (CAS); Ground Party/Off Board Designate***
 - ***Indirect Attack: 360° target relative azimuth attack***

VS Weapon System

Viper Strike Munition



Battle Management Systems (BMS)



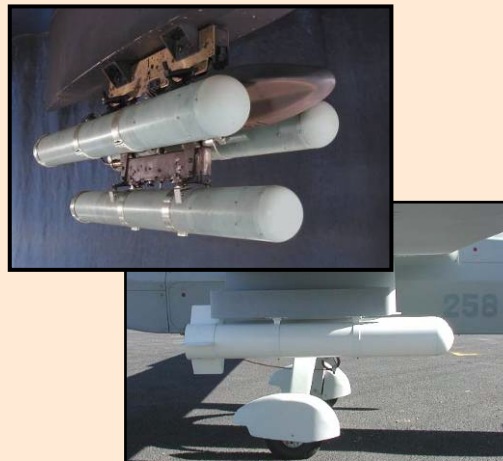
Laser Designators



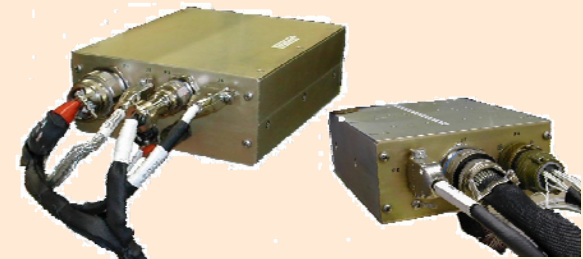
Launch Tubes



Launcher Racks



Munition Interface Unit (MIU)



CONOPS / TTPs, Training, Logistics

APKWS Proven Performance

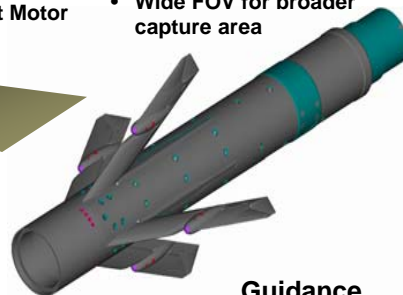
Mid-body Design is Supportable

- No platform modifications required
- No changes to weapons loading
- Limited pilot training required



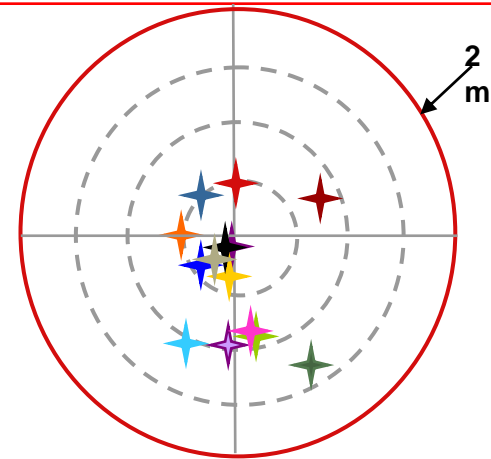
Mid-body Design is Reliable

- Optics protected prior to launch from adjacent firings, sand, moisture, etc.
- Wide FOV for broader capture area



No Impact on Warhead Effectiveness

- Warhead does not "fire through" guidance unit



Average laser spot to impact point
<0.5m or ~1½ ft

News

September 19, 2007

USMC Cobra



BAE SYSTEMS CONDUCTS FIRST EVER SHOTS OF
ADVANCED PRECISION KILL WEAPON SYSTEM FROM AN AIRCRAFT

News

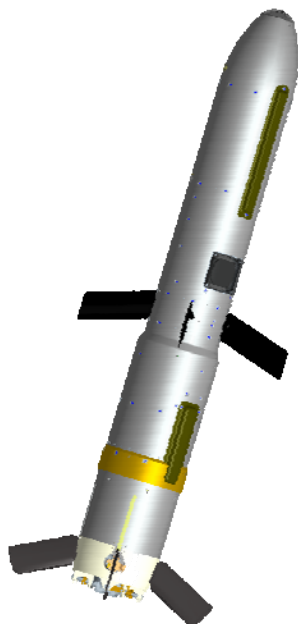
December 20, 2007

U.S. Army Kiowa Warrior

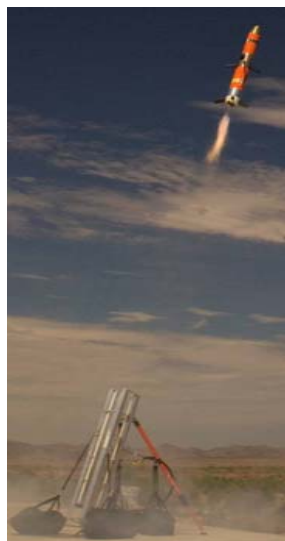


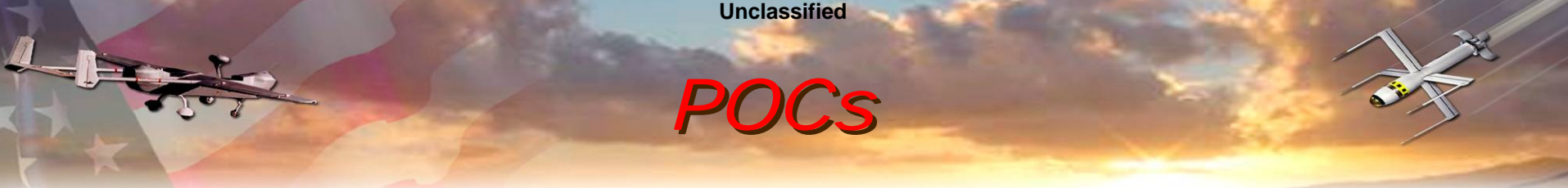
BAE SYSTEMS COMPLETES TWO TEST FIRINGS OF ADVANCED
PRECISION KILL WEAPON SYSTEM FROM ARMY HELICOPTER

Raytheon Missile Systems' Griffin™ Missile System



- Substantial internal investment by Prime Contractor.
- Extensive re-use and repackaging of proven weapon components.
- Highly successful flight-test and qualification series.
- Now in low-rate initial production.
- Tests show suitability for employment from host of ground and air platforms, and ground teams.
- Powered, maneuverable, small, lightweight, accurate and lethal, with reduced risk of collateral damage.





POCs

- **LtCol Sean Hayes, PM Small Guided Munitions**

256-313-3904

sean.hayes@msl.army.mil

- **Steve Borden, DPM Small Guided Munitions**

256-842-7725

steven.borden@msl.army.mil



USAF Gunship Precision Engagement Operations: Special Operations in the Kill Chain

Lieutenant Colonel Brenda P. Cartier
*Commander, 4th Special Operations Squadron
Hurlburt Field, Florida*



Overview



- AC130U Primary Roles and Missions
- Crew Complement
- Capabilities
- Kill Chain Integration



AC-130U Aircraft

- Modified C-130
 - AC-130A first appeared in Vietnam war
 - Highly specialized fire platform
- All based at Hurlburt Field, Florida
 - Limited number: 17
- Deployable worldwide
- Designed to support ground forces



Primary Roles and Missions

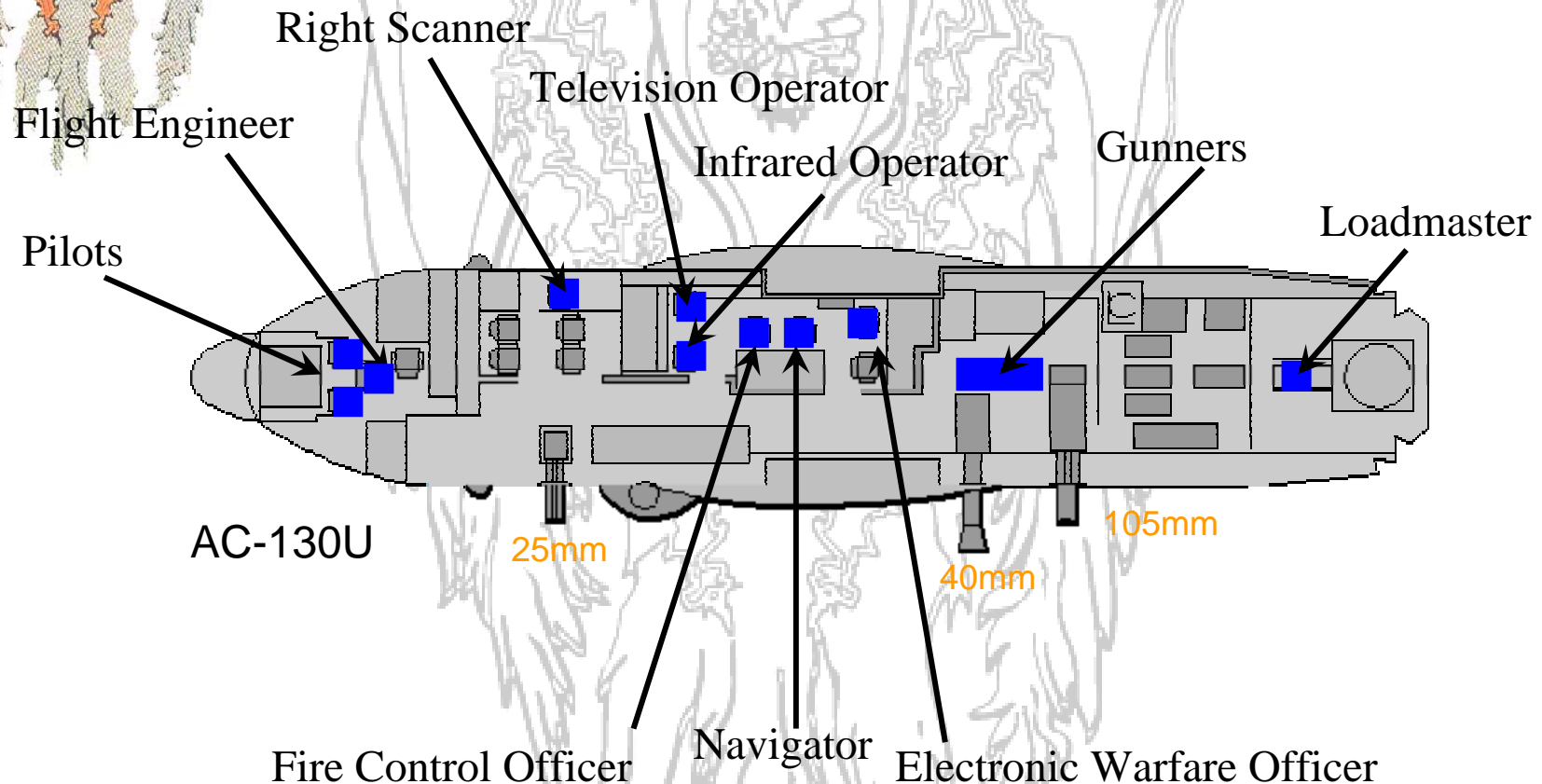
- Close air support
 - Airbase / point defense
 - Convoy escort
- Air interdiction
 - Pre-planned
 - Targets of opportunity
- Personnel recovery / combat search and rescue
- Reconnaissance
- Helicopter support
 - Landing zone identification / security
 - Enroute escort
- Military Operations in Urbanized Terrain
- Infiltration /exfiltration

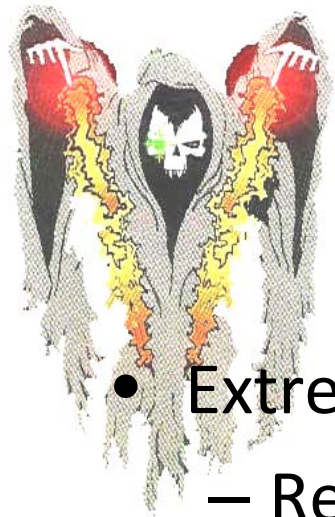


Gunship Deployments

- Feb 03 - Today OIF - Iraq
 - Sep 01 - Today OEF - Afghanistan
 - Mar - July 99 - ALLIED FORCE - Kosovo
 - 96 - ASSURED RESPONSE - Liberia
 - 93-99 - DENY FLIGHT/JOINT ENDEAVOR - Bosnia
 - 94 - SUPPORT DEMOCRACY - Haiti
 - 92-94 - RESTORE HOPE - Somalia
 - 91 - DESERT STORM - Iraq/Kuwait
 - 89 - JUST CAUSE - Panama
 - 83 - URGENT FURY – Grenada
-
- 4 SOS has been continuously deployed since Jan 03

AC-130U Crew Complement





Why Gunships?

- Extremely accurate gunfire
 - Reduce collateral damage
 - Real time BDA
- Long loiter time
- High SA of ground situation
 - 13 man gunship crew vs single seat asset
- Tailored weapons effect
 - Weapon/fuse combination chosen for specific targets

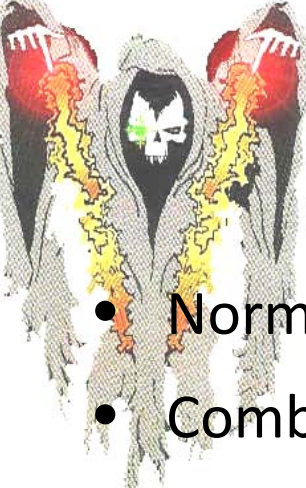
The background of the slide features a large, faint, stylized illustration of an AC-130U gunship. The aircraft is depicted in a dark, tactical style, with its wings spread and its characteristic gun pods visible. The overall tone is military and professional.

AC-130U Specialized Capabilities

- Long loiter time (5.5 hour unrefueled / limited only by crew with aerial refueling)
- Low yield weapons
- Optimized for night operations
- Ground situational awareness
- Training heavily focused on CAS



Performance

- 
- Normal T/O weight: 155,000 lbs
 - Combat load:
 - 3000 x 25mm
 - 256 x 40mm
 - 100 x 105mm
 - Max fuel endurance: 6.5 hrs unrefueled
 - Routine missions: 6 – 12 hours / 5 hour loiter time
 - Shooting altitudes: 4,000 AGL - 18,000 MSL



Navigation and Fire Control

- Redundant fire control computers
- Dual inertial navigation systems
- Global positioning system
- APQ-180 Strike radar
- Infrared detection set
- All light level television
- Head up display



Communications

- 4 x UHF LOS radios
- 2 x VHF LOS radios
- 2 x SATCOM (voice only) radios
- 1 x SATCOM (data) radio
- 2 x HF radios
 - All securable
 - 1 x UHF Have Quick II capable
 - 1 x VHF FM SINCGARs capable

Sensor Suite

- Infrared Detection Set (IDS)
 - Wide, medium, narrow fields of view
- ALL-TV
 - LIA, LTD/RF
 - Wide, medium, narrow fields of view
- Strike radar
 - Gives us our all-weather capability



AC-130 Armament

- 25mm Gatling gun
- 40mm Bofors cannon
- 105mm cannon
- All guns are trainable
 - Guns on hydraulic mounts move with sensors



Defensive Systems

- Radar warning receivers
- Electronic countermeasures
 - Radar jammer
 - Chaff
- Infrared warning receiver
- Infrared countermeasures
 - Flares
 - Infrared shields
 - Directed infrared countermeasures



Attack Geometry





Kill Chain Integration

- Find: Onboard sensors, networked assets, Ground Forces
- Fix: Kinetic or Onboard Sensors
- Track: Onboard Sensors
- Target: Gun/Ammo selection, marking
- Execute: Employ weapons
- Assess: Onboard sensors, networked assets, Ground Forces

Kill Chain Video





Limitations

- Unable to loiter in radar threat environment
 - Defensive systems are escape aid ONLY
- Daytime significantly increases vulnerability
- Limited capability against hardened targets
 - Requires coordinated weapons delivery
- Limited radar resolution
 - Targets must be radar significant or offsets used
- Limited use of LIA in target Area
 - Compromises gunship/ground party location



USAF Gunship Precision Engagement Operations: Special Operations in the Kill Chain

Lieutenant Colonel Brenda P. Cartier
*Commander, 4th Special Operations Squadron
Hurlburt Field, Florida*



Air Armament Center



*Deliver War-Winning Technology, Acquisition, Test, Sustainment...
Expeditionary Capabilities to the Warfighter*



Precision Strike Association Welcome to the Emerald Coast!

**Dave Eidsaune, Maj Gen, USAF
USAF Program Executive Officer for Weapons
Commander, Air Armament Center**

U.S. AIR FORCE

10 Mar 2009

Integrity - Service - Excellence



Eglin AFB – Full Spectrum Operations



Research



Development/Acquisition



Developmental Test



Operational Test



**Combat
Training/
Operations**

Arming Warriors

*Transition
Technology to
Weapon Systems
and Provide War
Winning
Capabilities On
Time, On Cost*

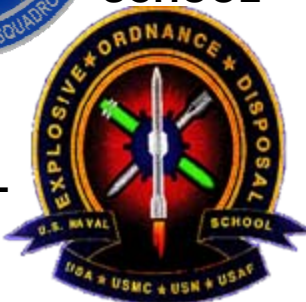




DEFENSE THREAT
REDUCTION AGENCY



20th
SPACE
CONTROL
SQDN



NAVY EOD
SCHOOL



AFRL MUNITIONS



AIR ARMAMENT CENTER



AFOTEC



53rd WING



COAST
GUARD



ARMY
RANGERS



ARMY
7TH SFG



919th SPECIAL
OPS WING



33 FW





Eglin Land Ranges

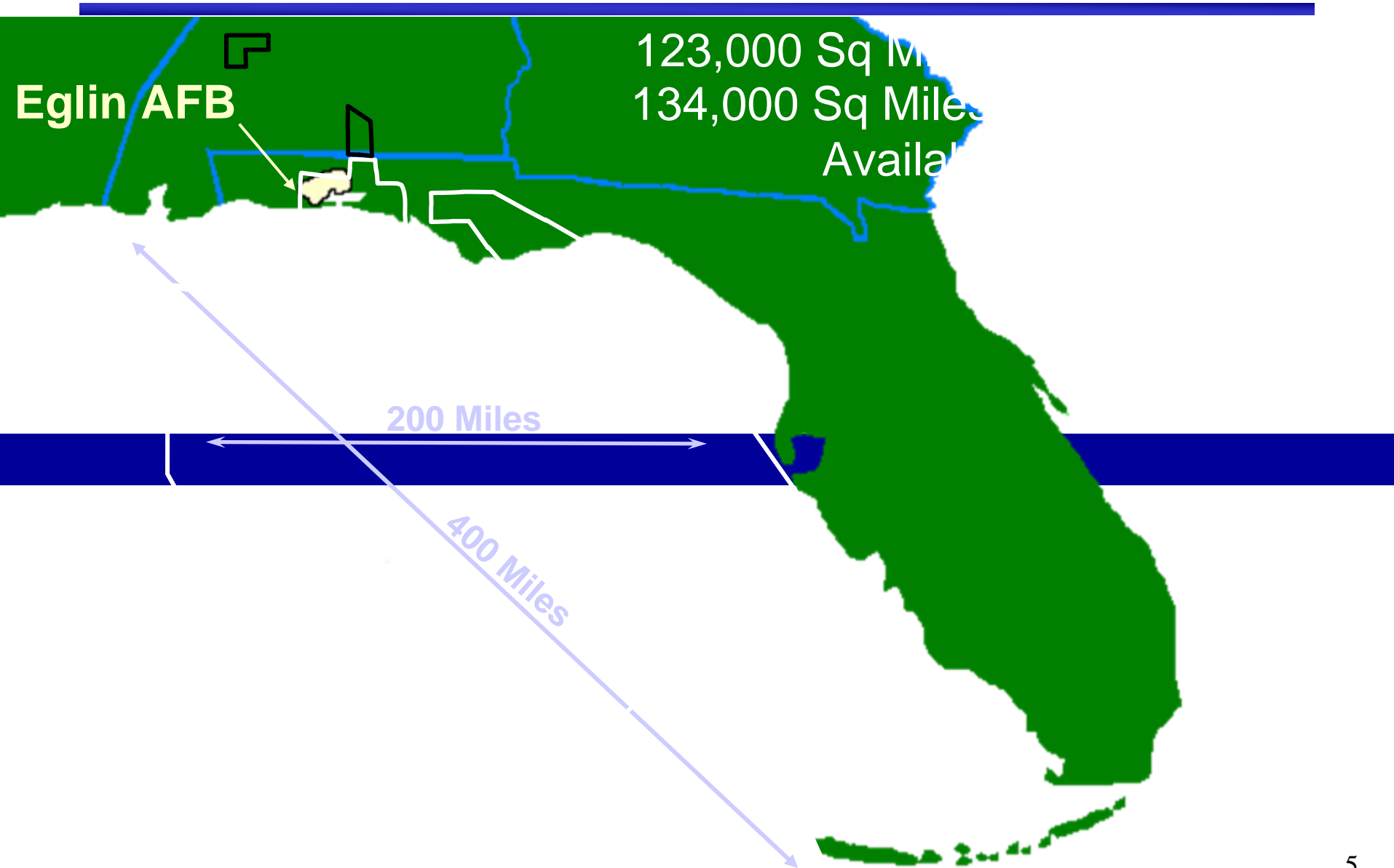


463,448 Acres
724 Square Miles





Eglin Water Ranges



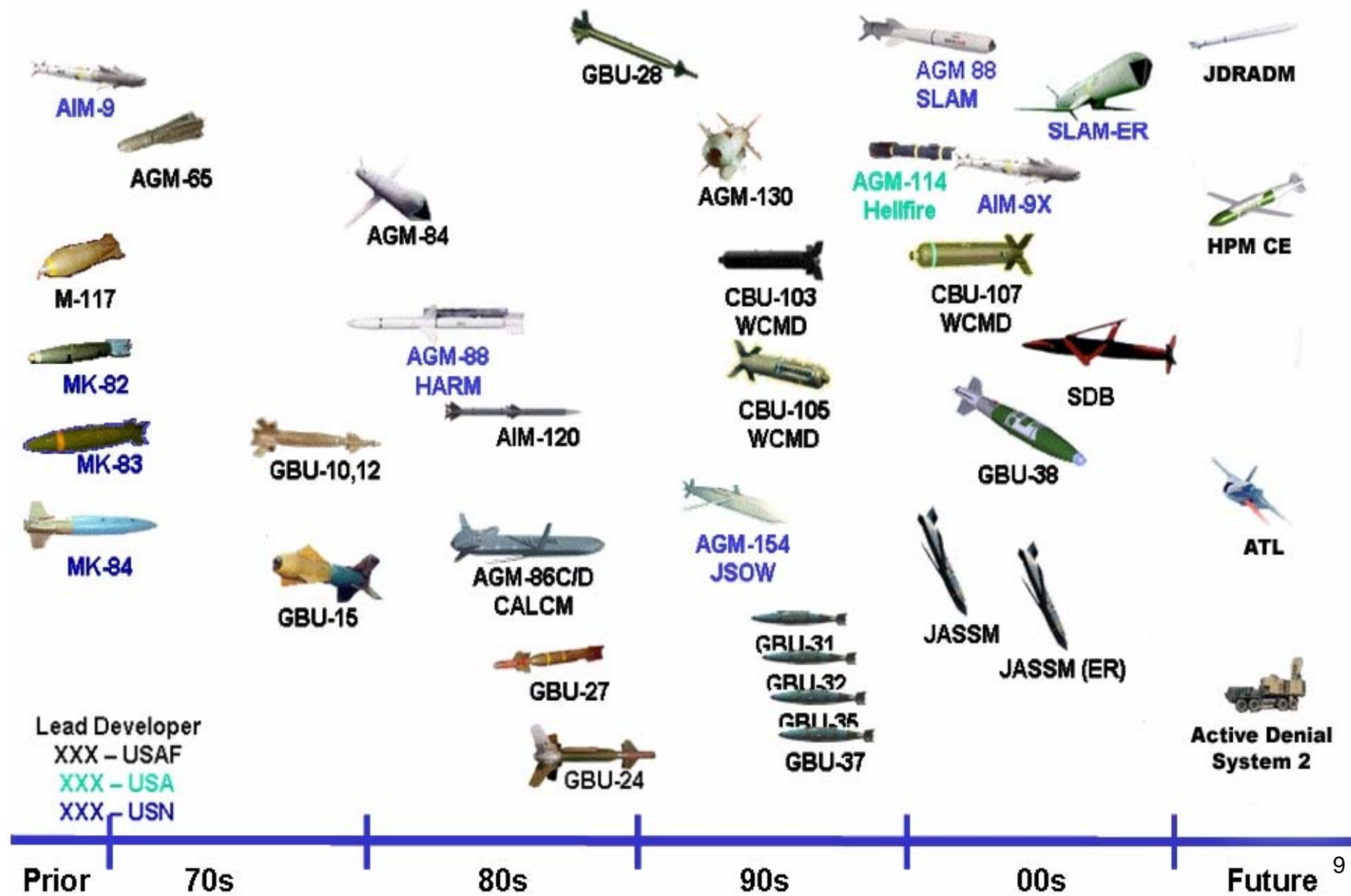


Eglin Video





Precision Strike – Revolutionary Change





Acquisition Strategies

Tim Harp

DASD(C3ISR & IT ACQUISITION)

11 March 2009



Topics

- ***Information Technology Acquisition Environment***
- DoD IT Acquisition Challenges
- DoD IT Acquisition Context
- DoD IT Acquisition Process
- Observations



The Emerging Intelligence Enterprise

- The processes are evolving
 - Systems are less stove-piped and more data centric
 - Moving away from proprietary systems
 - Service Oriented Architecture are providing access to data stores
 - Moving toward a more responsive, agile acquisition process
- But the fog of war is lifting slowly and unevenly
 - Iraq's experience has validated the view that network operations aren't just about the technology
 - While new technology is an enabler ...
 - Real transformation is "relevant technology," responsive acquisition processes, leadership optimizing change and rapid CONOPS development



Current Generation of C4I War Fighters

Today's leaders & soldiers are digital natives and use IT technologies to their advantage for situational awareness and collaborative, agile decision making



*The Environment:**

- Lack of information and services that are visible, accessible and understandable
- Information “silos”-- capability needed to move information from one stove-pipe to another
- Hard-wire interfaces aimed at predetermined needs unresponsive to dynamic environment
- Continue to not leverage the latest information technology solutions available commercially

“Digital Natives” trapped in industrial-era institution

* Source: DSB Summer Study 2006



Information Technology Style

- **Digital Native**

- A person who has grown up with digital technology such as computers, the Internet, mobile phones, and MP3
 - Typically born after 1980

- **Digital Immigrant**

- A person not born into the digital world:
 - has adopted many aspects of the technology, but just like those who learn another language later in life, retains an *accent* because they still have one foot in the past
 - challenged to communicate effectively with digital natives

- **Analog**

- A person who chose to not adopt emerging technology



Recent Legislation(10 U.S.C. Chapter 144A)

- Defines Major Automated Information System (MAIS) in statute
- Requires an MAIS annual report to Congressional defense committees (analogous to a Selected Acquisition Report)
- Designates USD(AT&L) and Service Acquisition Executives as Senior Officials responsible for programs
- Requires Program Managers to report quarterly to the Senior Official any variance from the original baseline
- Imposes a time-certain development requirement of 5 years from Milestone A to Initial Operational Capability (IOC)
- Defines 2 new MAIS program deviation reports to Congress
 - Significant program change
 - Critical program change



Need to Change -- Congress Demanding It

- FY07 National Defense Authorization Act
 - Section 816. Major Automated Information System (MAIS) programs codified in statute
 - Requires annual reports to Congress for IT (FY 09)
 - Nunn-McCurdy-like reporting when breaches occur
 - Section 811. Time-certain development for DoD IT business systems
 - Milestone Decision Authority (MDA) must certify that system will achieve IOC in 5 years or less before granting Milestone A approval
- FY09 National Defense Authorization Act
 - Section 811. MAIS programs
 - Defines “5 years to IOC” requirements



Need to Change -- Others Highlighting It

- May 19–20, 2008 DSB Meeting
 - Hon John Grimes (ASD(NII)/DoD(CIO))
“Hardware development processes ill-suited to IT acquisition”
 - LTG Jeff Sorenson (Army CIO/G-6)
“How we can make it better.... Policy – Acquiring IT not like tanks”
- Defense Acquisition Performance Assessment (3/2006)
- Beyond Goldwater Nichols Reports (2003/2004)
- GAO Assessment on “Information Technology: DOD’s Acquisition Policies and Guidance Need To Incorporate Additional Best Practices And Controls” (July/2004)*
 - *“As you know, the way in which DOD has historically acquired information technology (IT) systems has been cited as a root cause of these systems failing to deliver promised capabilities and benefits on time and within budget”*



Need to Change -- New Leadership

- The Federal Government has an overriding obligation to American taxpayers... Since 2001, spending on Government contracts has more than doubled, reaching over \$500 billion in 2008. During this same period, there has been a significant increase in the dollars awarded without full and open competition and an increase in the dollars obligated through cost-reimbursement contracts. *President Obama, March 04, 2009*
- Members of a special congressional panel will meet this week to begin charting an ambitious agenda: finding the underlying causes of failures in the defense acquisition process and recommending how to fix them. *Washington Post March 09, 2009*
- It takes longer to declare a new [program] start than the lifecycle of the software package... It's not technology. This is culture. This is the imperative to change and be convinced that that imperative is real and will advantage us... Getting "the inertia going to get the system changed is the challenge that's in front of us." *Joint Chiefs Vice Chairman Gen. James Cartwright, March 04, 2009*
- Better Weapon System Outcomes Require Discipline, Accountability and Fundamental Changes in Acquisition Environment
 - *GAO Report (June 3, 2008) Testimony Before Committee on Armed Services, U.S. Senate*



Leveraging Previous Work

- Beyond Goldwater-Nichols Reform, Center for Strategic & International Studies (CSIS), March 2004/July 2005
 - Many organizational structures and processes initially constructed to contain a Cold War superpower in the Industrial Age are inappropriate for 21st century missions
- 2006 DSB Summer Study on Net Centric Capabilities
 - Information “silos”-- capability needed to move information from one stove-pipe to another via ad hoc solutions
 - Hard-wire interfaces aimed at predetermined needs
 - Much of IT in theater has been supplemental funded and not part of a “planned” capability putting in question the long term viability
- Transitioning Defense Organizational Initiatives, *An Assessment of Key 2001-2008 Defense Reforms*, CSIS, November, 2008
 - Study effort aimed at informing the next Secretary of Defense’s transition decisions
- Other ongoing DSB and National Academies studies



Topics

- Information Technology Acquisition Environment
- ***DoD IT Acquisition Challenges***
- DoD IT Acquisition Context
- DoD IT Acquisition Process
- Observations



*Information Technology (IT)**

Information Technology: Any equipment or interconnected system ...of equipment that is used in automatic :

- acquisition
- storage
- manipulation
- management
- movement
- control
- switching
- interchange
- transmission
- reception

of data or information by the executive agency

* Title 40 USC (formerly known as the Clinger Cohen Act of 1996)



Program Definitions/Thresholds

- **Major Defense Acquisition Program (MDAP) (10 USC 2430)**
 - Dollar value as estimated by USD(AT&L) to require an eventual total expenditure
 - RDT&E of more than \$365 million in FY 2000 dollars or
 - Procurement of more than \$2.190 billion in FY 2000 dollars
 - MDA designation as special interest
- **Major Automated Information System (MAIS) (10 USC 2445)**
 - Dollar value of AIS estimated by the DoD Component Head
 - Program costs (all appropriations) in any single year in the excess of \$32 million in fiscal year (FY) 2000 dollars,
 - Total program costs in excess of \$126 million in FY 2000 dollars
 - Total life-cycle costs in excess of \$378 million in FY 2000 dollars
 - MDA designation as special interest
- **Major System Acquisition (41USC 403(9))**
 - A system shall be considered a major system if:
 - Total expenditures for the system are estimated to exceed \$750,000 (based on fiscal year 1980 constant dollars)
 - Designated by the head of the agency responsible for the system



DoD past attempts to adapt IT acquisition

Initiatives

- CIM - Corporate Information Management
- CCA - Clinger Cohen Act
- RIT- Rapid Improvement Team
- BMMP – Business Management Modernization Program
- BTA/ERAM – Business Transformation Agency/ Enterprise Risk Assessment Model

Lessons

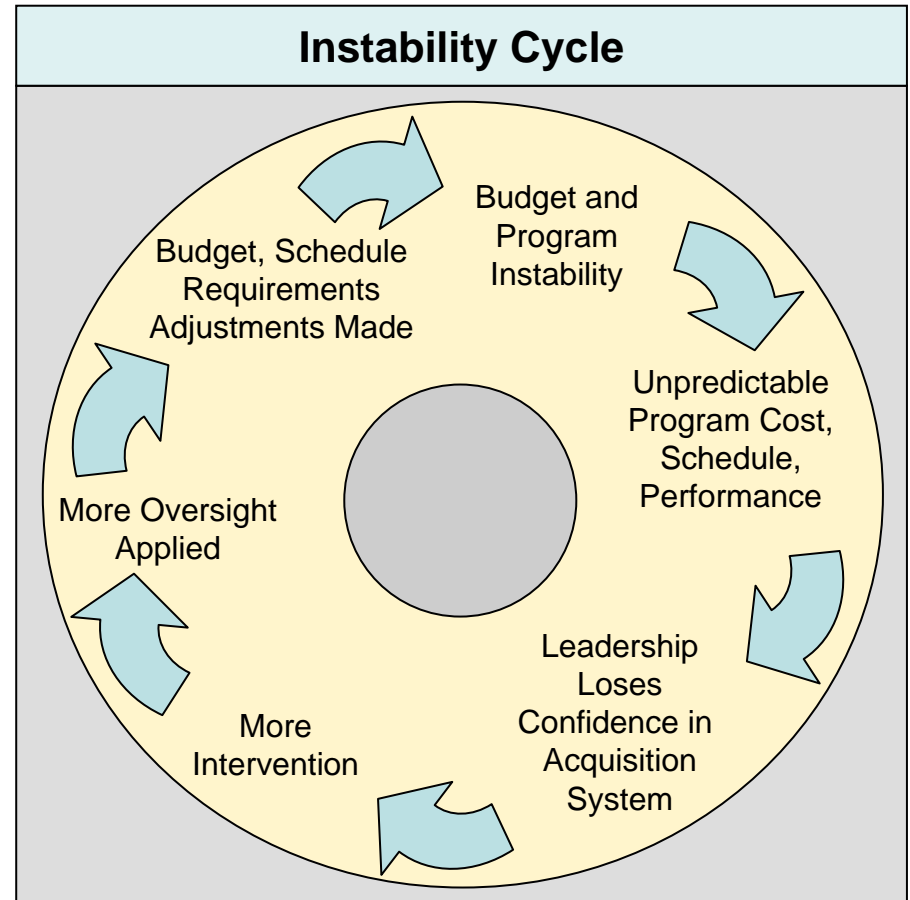
- Need requirements and Funding stability
- IT acquisition needs to be aligned with mission sponsor
- Most effective if limited to 50,000 to 75,000 ESLOC
 - 5-10 people and 12 month increments
- Change management is key to success – its not about the system



Defense Acquisition Performance Assessment (DAPA) Report

The Government-Induced Cycle of Instability

- Because our major processes are not well integrated,
 - we have an unrecognized , government-induced and long-standing cycle of instability
 - which causes unpredictability in costs, schedule, and performance
 - that ultimately results in development programs that span 15-20 years with substantial unit cost increases
 - leading to loss of confidence in DoD acquisition systems.



Major contributing factors to program instability are funding and requirements instability



IT Requirements Challenges

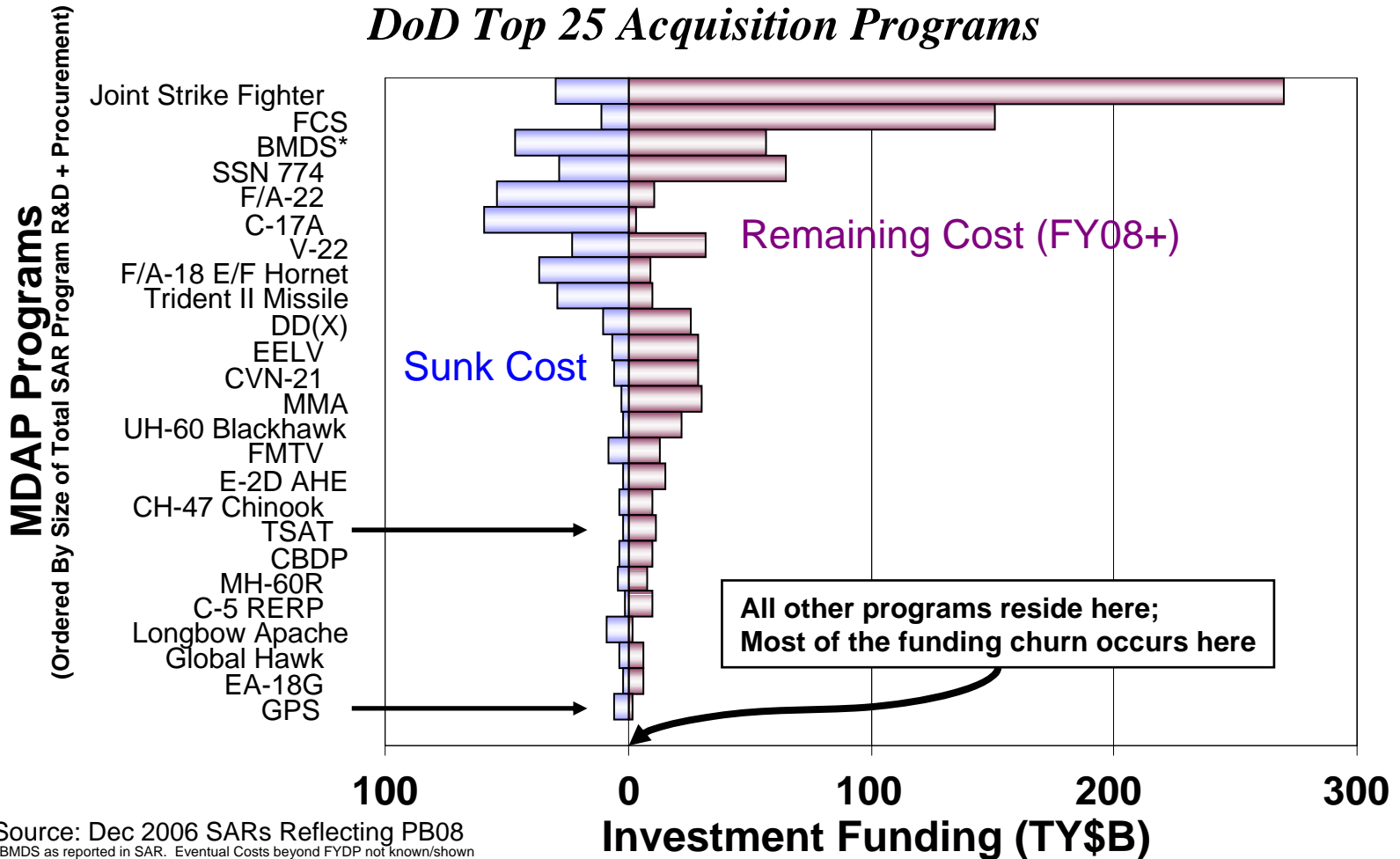
- *Considerable trade space for IT requirements*
- *Moore's Law drives the IT development environment*
 - Technology changes faster than the PPBS
 - Technology changes faster than the Acquisition cycle
 - Many Traditional S&T functions now performed by industry
 - COTS vs GOTS
 - Independent of DoD programs
 - Constant pressure to adopt "better" solution
 - Technology Readiness Assessments no longer as relevant
 - Technology is largely matured commercially
- *Evolving warfighting concepts drive requirements change*
 - JUONS drive ACTD/JCTD/other rapid acquisition efforts
 - Compete with programs of record

IT requirements instability occurs at levels below those tracked by JCIDS and DAB processes



Funding Perspective

DoD Top 25 Acquisition Programs



IT programs are at the tip of the tornado – more turbulent



Topics

- Information Technology Acquisition Environment
- DoD IT Acquisition Challenges
- ***DoD IT Acquisition Context***
- DoD IT Acquisition Process
- Observations



Net Centric Environment: Context

Strategic Challenge – UNCERTAINTY

“Uncertainty is the defining characteristic of today’s strategic environment.” (National Defense Strategy)

- Leave behind the reasonable predictability of the past
- Adjust to an era of surprise and uncertainty

Strategic Response – AGILITY

“We have set about making US forces more AGILE and more expeditionary.” (Quadrennial Defense Review)

- Enterprise-wide: Battlefield Applications; Defense Operations; Intelligence Functions; Business Processes
- Capabilities Based: Access, Share, Collaborate
- Fundamental Changes: Process, Policy, Culture
- Emphasis Shift: From moving the user to the data – to moving data to the user

Net Centricity Confronts Uncertainty with Agility



IT Evolution

Pre-1990's

- GOTS Hardware & Software
- Functional code development
- Back room non-combat
- Stovepipe independent systems
- Centralized
- Unique data definition
- Dedicated interface design
- System security
- Big Bang Operational test
- Service-oriented warfare
- Packard Commission

Today

- COTS Hardware & Software
- Interface and integration code
- Ubiquitous, embedded
- Net-centric
- Distributed
- Authoritative data sources
- Net-enabled
- Information Assurance
- Integrated, dynamic DT/OT
- Joint Warfare
- Clinger-Cohen

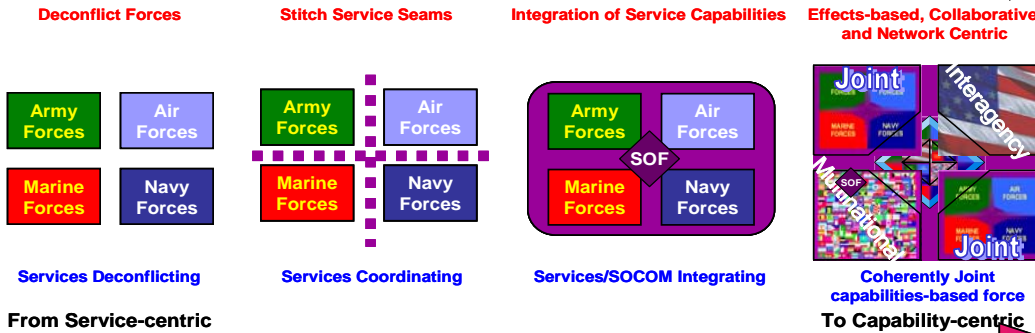
*IT system development characteristics -
no longer weapon system-like*



The Co-Evolution

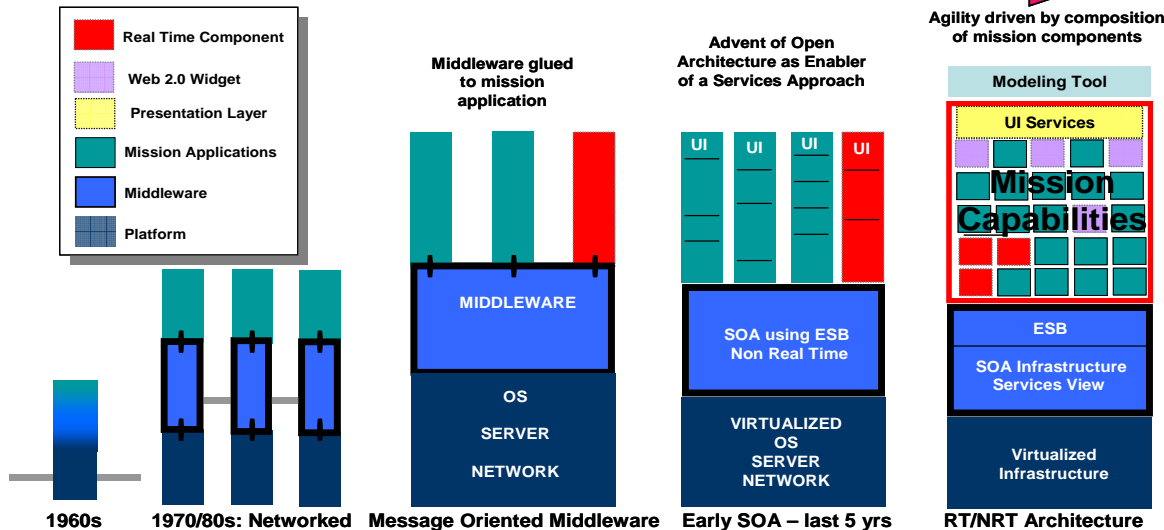
Leveraging IT to Support Mission Operations

Evolution of DoD Operational Environment



Mission needs drive this transformation

Transforming of Information Environments

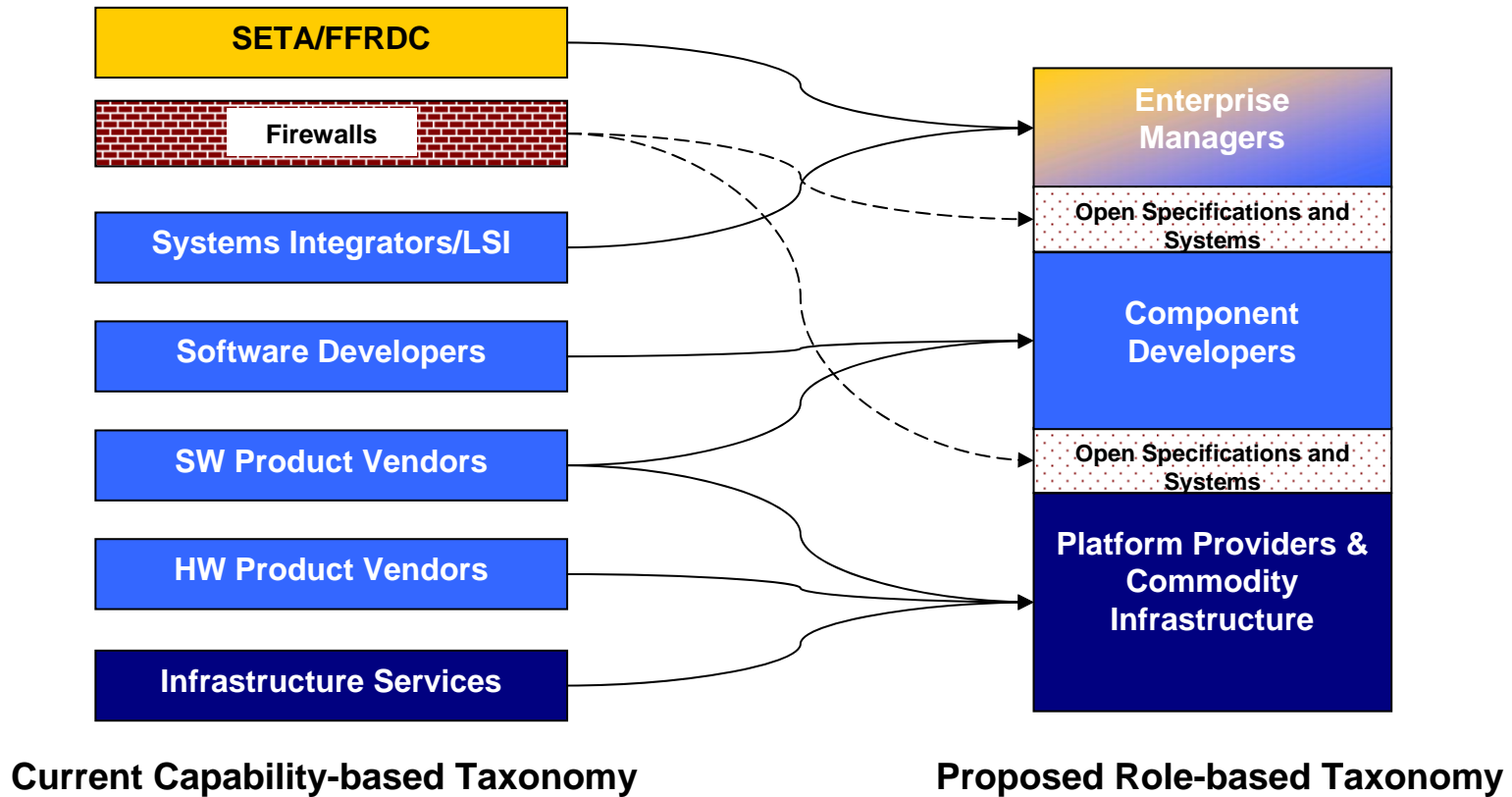


Commercial IT trends drive transformation

DoD is behind industry – now at early SOA phase



Changing Roles



As the market evolves, the roles and how contractors interact must evolve as well. Traditional firewalls become published open system specifications.



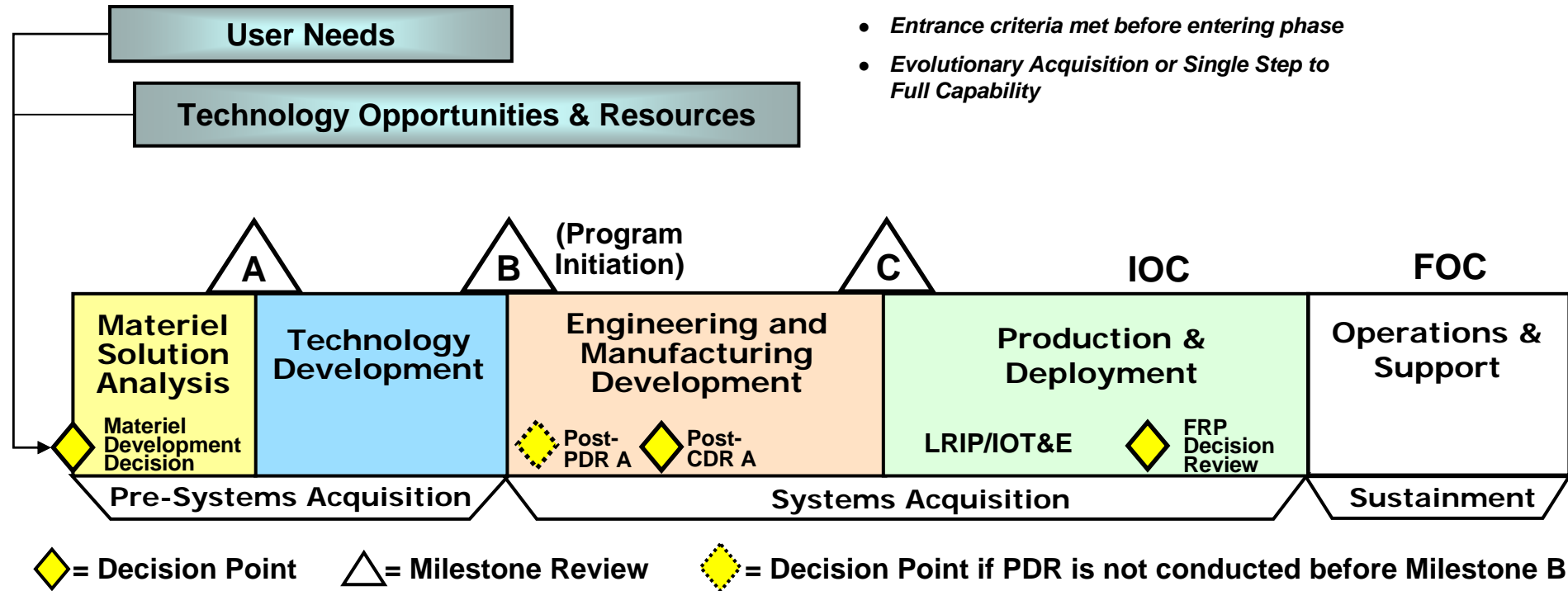
Topics

- Information Technology Acquisition Environment
- DoD IT Acquisition Challenges
- DoD IT Acquisition Context
- ***DoD IT Acquisition Process***
- Observations



Latest Acquisition Process (Dec 2008)

- The Materiel Development Decision precedes entry into any phase of the acquisition management system
- Entrance criteria met before entering phase
- Evolutionary Acquisition or Single Step to Full Capability

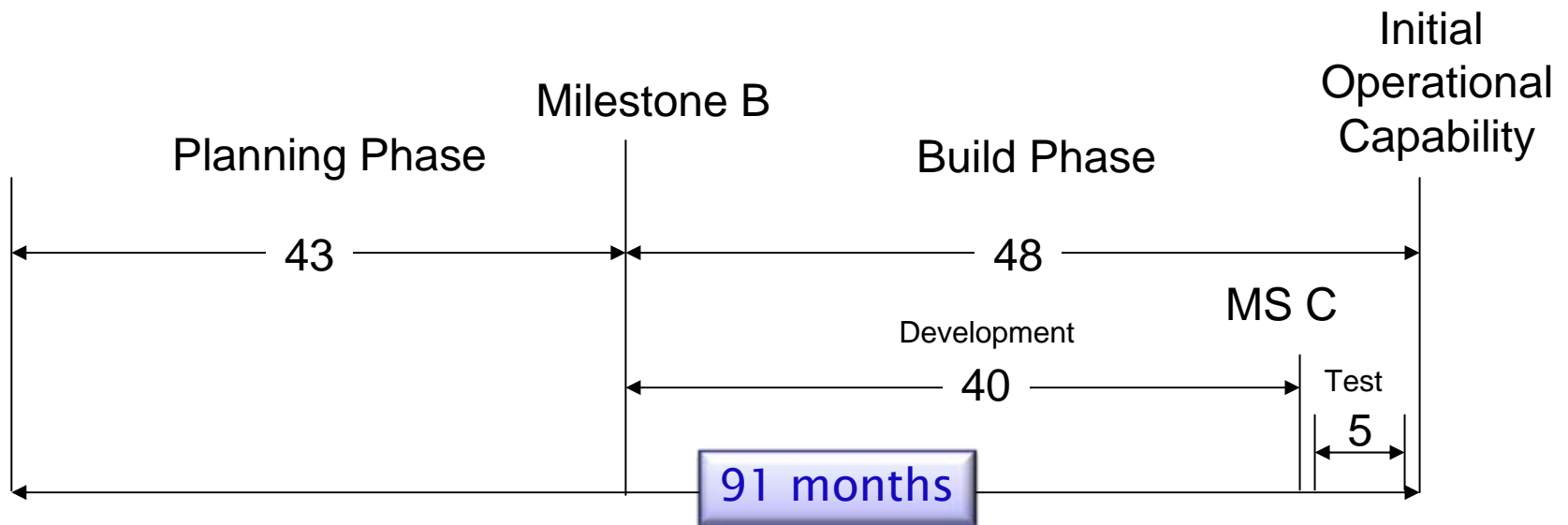


Deliberate toll gate decision process fundamentally unchanged for over thirty years – Analog



DoD IT Acquisition Cycle-Time

*Average for all 32 MAIS
reaching IOC in 2004-9*



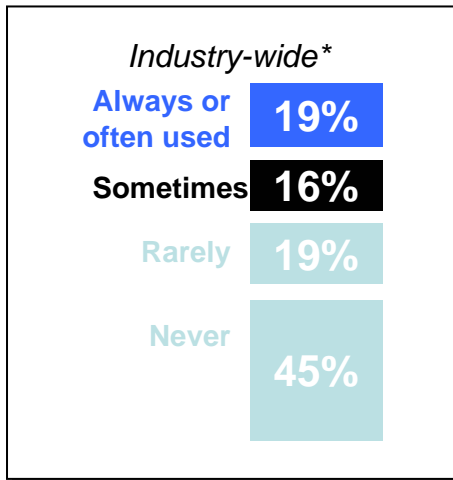
Note: Equivalent non-MAIS Average is 8.5-16 years

Counterbalance to Speed of IT Innovation



Eliciting the “Right” Technology – IT programs

- Challenge of bringing most relevant technology



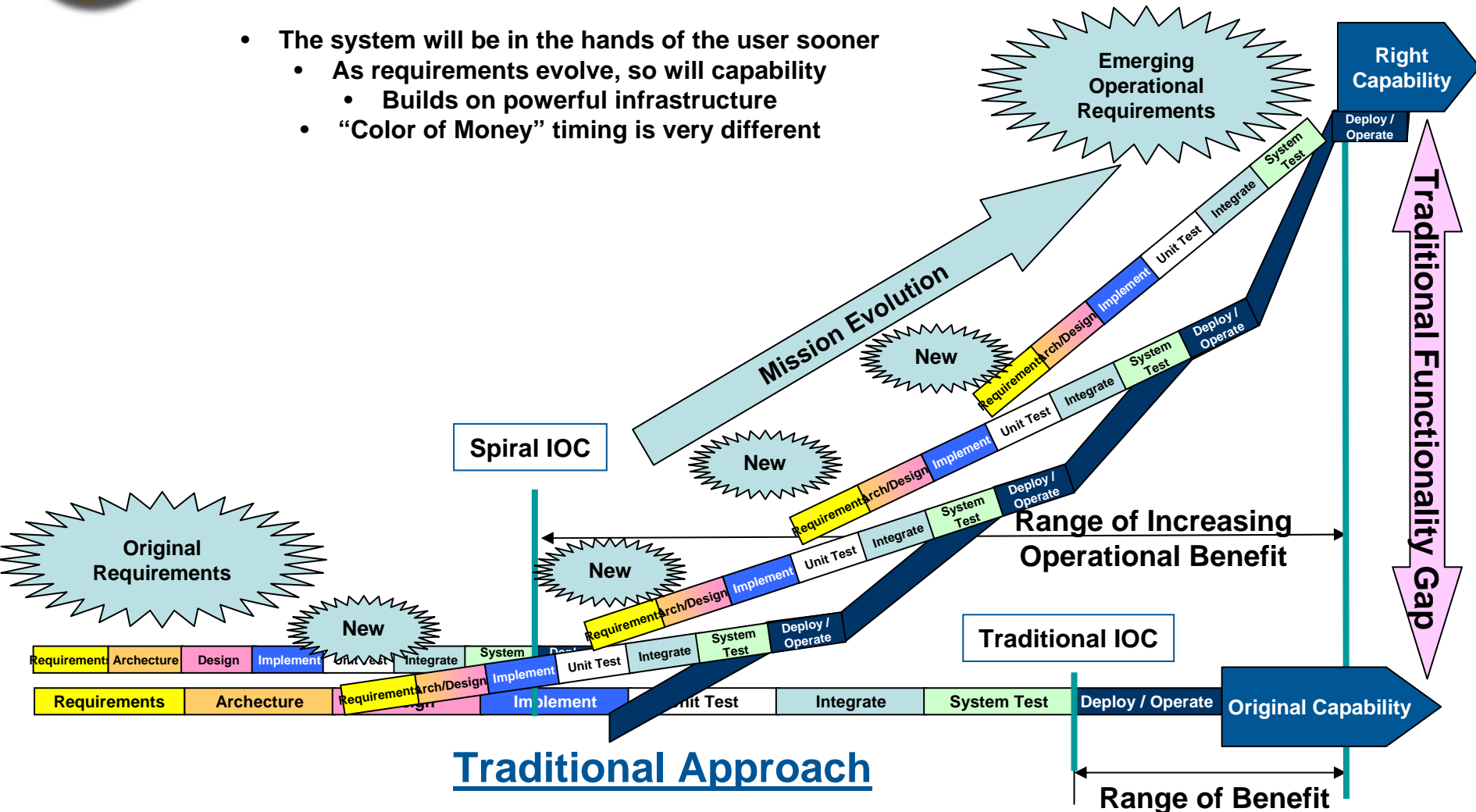
*Source: “The Chaos Chronicles,” The Standish Group, 2003.

- Independent research organization (Standish Group) report nearly **two-thirds** of the features built into technology solutions represent **waste**
- 2 of top 3 reasons for program failure due to lack of user involvement and incomplete - misunderstood requirements
- Spiral acquisition model offers multiple opportunities
 - Prioritize requirements based upon
 - User feedback
 - Realized risk (knowledge based decisions)



Spiral Approach Adds Value

- The system will be in the hands of the user sooner
 - As requirements evolve, so will capability
 - Builds on powerful infrastructure
 - “Color of Money” timing is very different



Requires strong enterprise governance



Balancing Extremes in Acquisition

	“Classic Waterfall”	“Spiral”	“Extreme”
Project Management	<i>Deterministic</i> <ul style="list-style-type: none">Detailed plan for entire projectScope-boxed phasesTrack progress by milestones completed	<i>Evolutionary</i> <ul style="list-style-type: none">Plan for entire project; varying granularityTime-boxed phasesTrack progress also by value delivered	<i>Evolutionary</i> <ul style="list-style-type: none">No plan for entire projectLimited concept of phasesTrack progress for only current deliverable
Development Process	<i>Big up front design</i> <ul style="list-style-type: none">Design all before in complete detailEnd-to-End Enterprise ArchitectureIntegrate only onceOne big testing phase	<i>Just in time, quality</i> <ul style="list-style-type: none">Design to support risk and value-driven designExecutable enterprise architecture planningMultiple deliveriesCombined DT/OT (Early & continuous testing)	<i>Just in time, quality</i> <ul style="list-style-type: none">Design all just-in-time – nothing up frontMinimal design documentationContinuous integrationNo dedicated test
Collaboration	<i>Low</i> <ul style="list-style-type: none">User involvement only at project start and completion“Throw it over the wall” requirements communication modelCommunication via periodic status meetings (quarterly or greater)	<i>High</i> <ul style="list-style-type: none">Frequent, regular User involvementCross-group collaboration via frequent checkpointsStrong governance with cross-functional teams	<i>High</i> <ul style="list-style-type: none">Continuous face-to-face User involvementDaily standup meetingsSelf organizing collaboration & teams



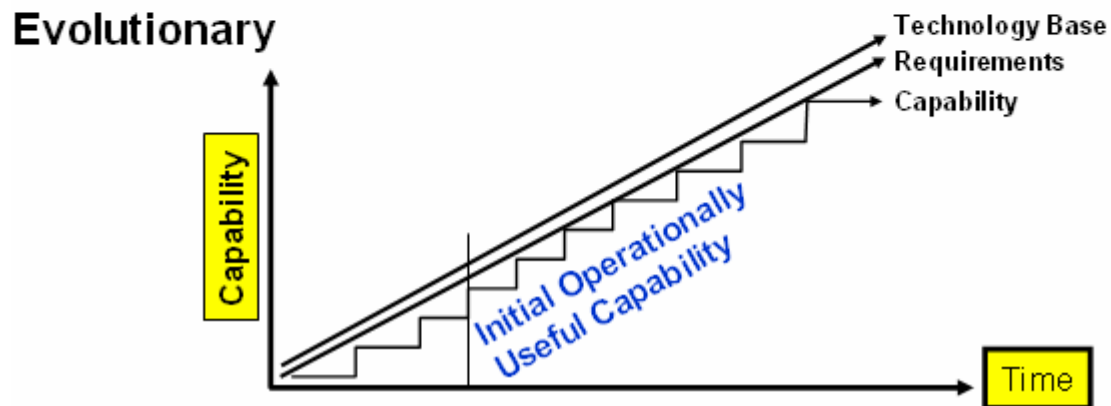
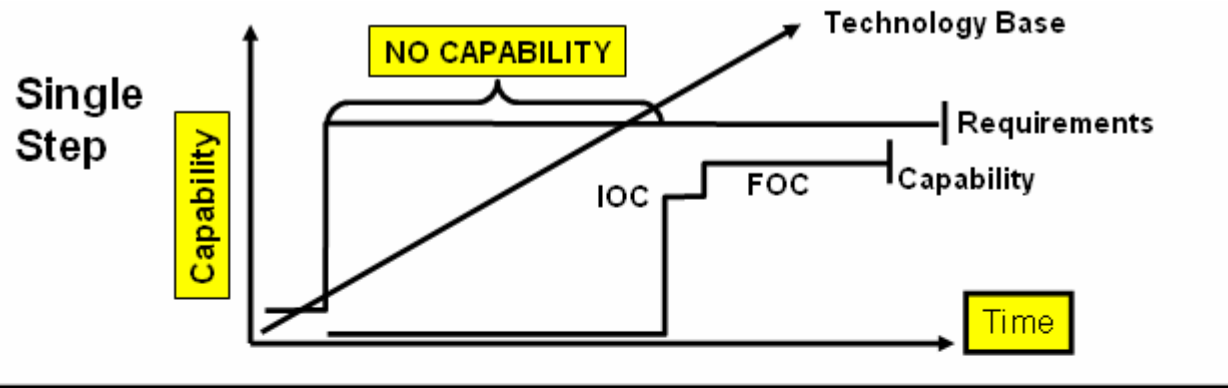
Where Do You Start ?

- Stable requirements
 - Smaller programs, loosely coupled based on commercial standards
- Stable funding
 - Shorter duration, parallel efforts
 - 5-5-5
- Competition
 - Design to match market capabilities
 - Know your supplier



Appropriate Acquisition Models

Balancing Extremes





Picking the Right Metrics

- Earned Value Management
- Headcount
- Software – DRs, Code Production
- Critical Path/Integrated Master Schedule
- Risk Cubes/Risk Management
- Critical Events: SRR, SDR, PDR, CDR



Picking the Right Acquisition Model

- Experimentation
 - Advanced Concept Technology Demonstration
- Quick Reaction Capability
 - Immediate Operational Need
- Spiral Model
 - Information Technology
- Traditional Model
 - Platforms



Topics

- Information Technology Acquisition Environment
- DoD IT Acquisition Challenges
- DoD IT Acquisition Context
- DoD IT Acquisition Process
- ***Observations***



My Observations

Creating World Class Acquisition Environment

- Trained and Experienced PM's critical for success
- Before program enters development, performance criteria must be finalized
- Technology maturity before committing to program
- Stable funding a pre-requisite for program success
- **Apply correct acquisition model**
- Partnering with proven (competent & motivated) contractor
- Follow deliberate and disciplined process; **select & use appropriate management metrics**



Precision Strike Annual Review

“Munitions Roadmap for the Future”

Col Kirk Kloeppel
Director
Munitions Directorate





Approved for Public Release 96 ABW/PA No. 96ABW-2009-0116

LEAD | DISCOVER | DEVELOP | DELIVER

Weapons Video





Outline



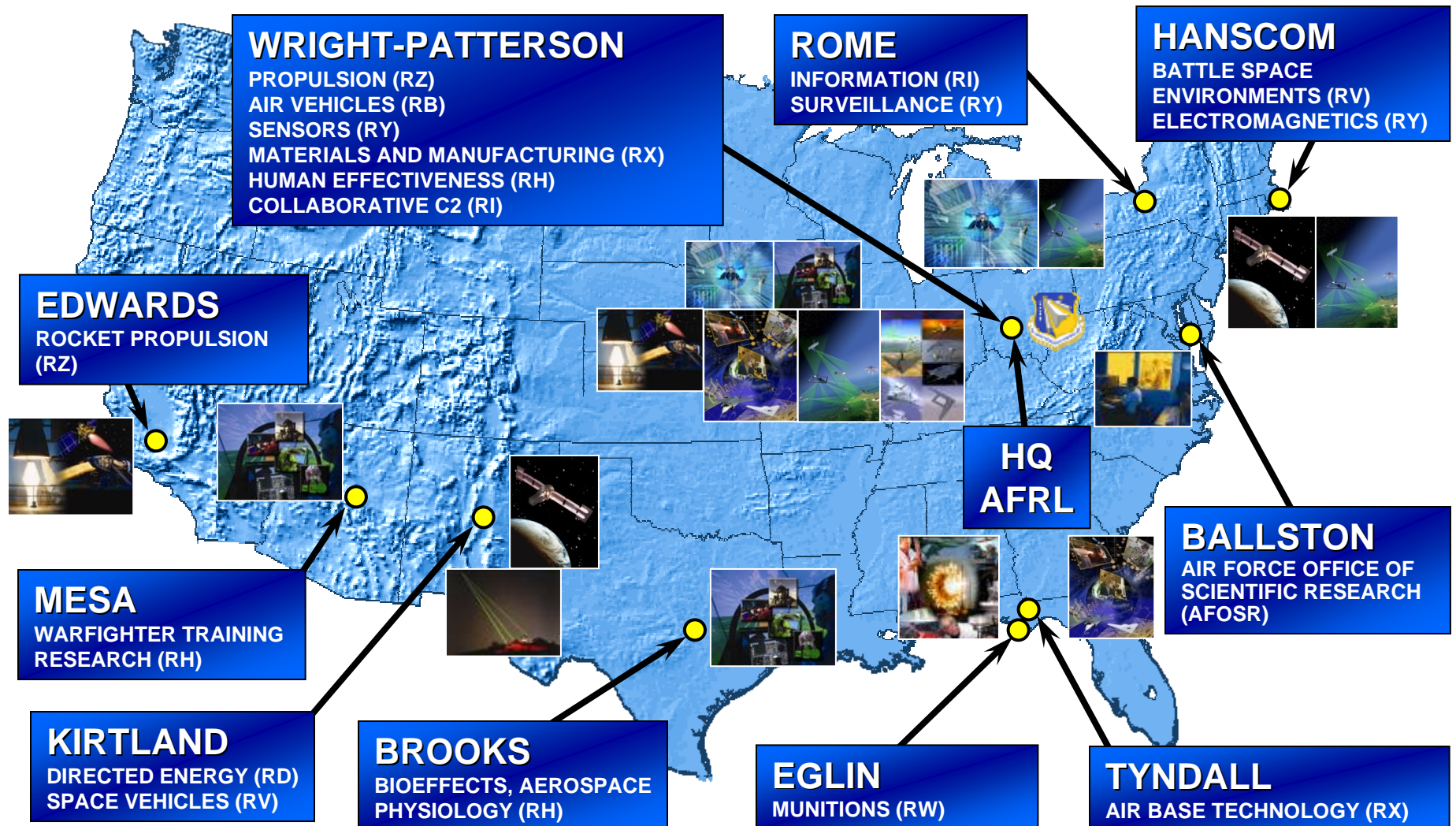
- **AFRL Introduction**
 - **Sites World-wide**
 - **AFRL Strategic Plan**
 - **AFRL Focused Long-Term Challenges (FLTCs)**
- **Munitions Directorate (RW)**
 - **Vision / Mission**
 - **Capability Based Planning**
- **Strong Record of Demonstrating Integrated Capabilities**
- **Conclusions**



AFRL

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40 Sites World-Wide



Approved for Public Release 96 ABW/PA No. 96ABW-2009-0116



Capability-Based S&T Strategy – Strategic Planning Vectors



The *Air Force Capability-Based Science & Technology Strategy* presents a considered and incremental approach to **transforming the science and technology (S&T) investment focus of AFRL**. It offers a strategic look at aligning the priorities for nurturing and developing core competencies as well as aligning the pursuit of particular technologies toward the solution of high-priority problems. --- Executive Summary, pg 4

S&T Strategy

Anticipate, find, fix, track, target, engage
And assess – anything, anywhere, anytime

Universal
Situational Awareness

Deliver Precision Effects
(DPE)

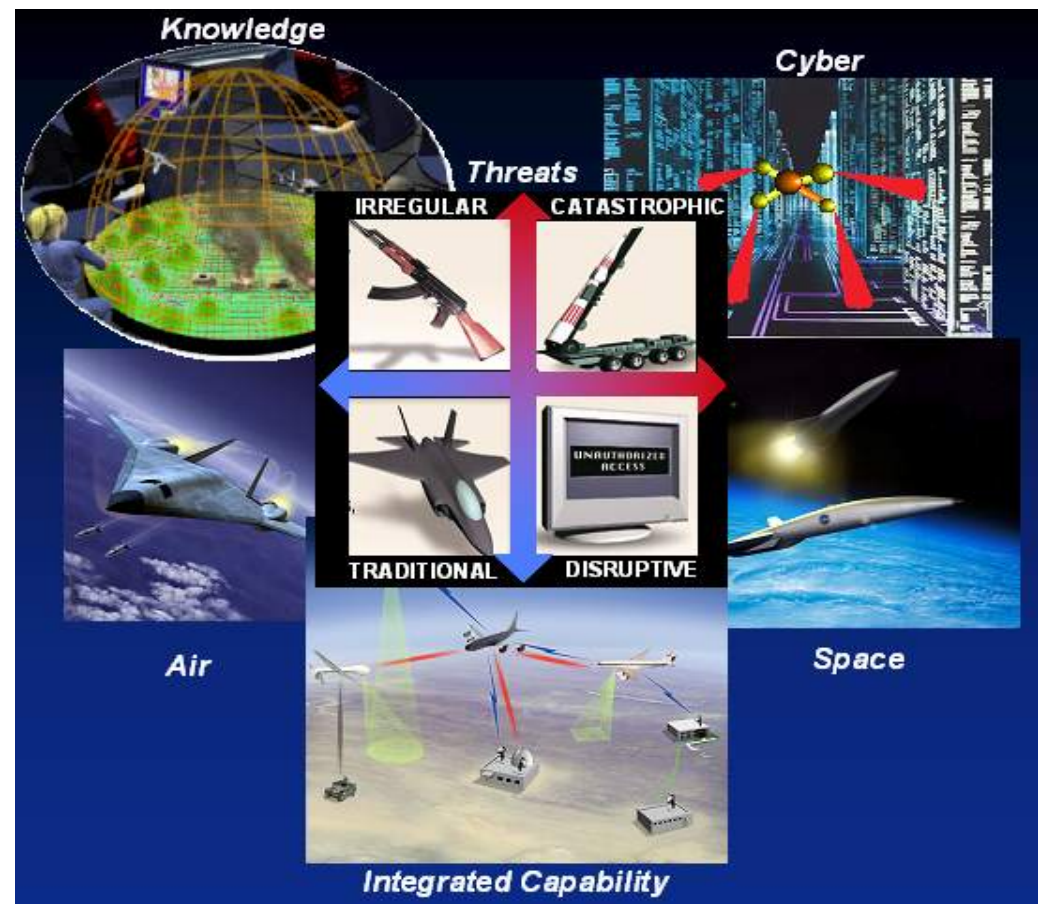
Access and Survive
in the Battlespace



Focused Long Term Challenges

Delivering the Air Force S&T Vision Through Leadership, Discovery, Innovation, and Integration.

1. Anticipatory Command, Control & Intelligence (C2I)
2. Unprecedented Proactive Surveillance & Reconnaissance (S&R)
3. Dominant Difficult Surface Target Engagement/Defeat
4. Persistent & Responsive Precision Engagement
5. Assured Operations in High Threat Environments
6. Dominant Offensive Cyber Engagement
7. On-demand Theater Force Projection, Anywhere
8. Affordable Mission Generation & Sustainment







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AFRL Munitions Directorate Vision & Mission



Vision:
**Precision Engagement ...
Delivering Desired Effects**

Mission:
**Lead the discovery, development,
integration and transition of affordable
precision engagement technologies for
our air, space, and cyberspace force**



Munitions Directorate Organization



Executive Officer
Capt Josef Peterson



Director
Col Kirk Kloeppel



Deputy Director
Ms Gail Forest



Associate Director
Dr John Wilcox



Chief Scientist
Dr Bob Sierakowski



Adv Guidance Division
Mr James Moore



Ordnance Division
Mr Scott Teel



Assess & Demo Division
Col John Williams

Munitions Directorate
Product Divisions



Financial
Mr Paul Higgins



Contracting
Ms Stacey Darhower



Corp Development
Ms Effie Krug



Integration & Ops Division
Mr Rich Mook



Senior IMA
Col Mark Koch



Ordnance Division (RWM)



ORDNANCE DIVISION

Core Competency
Sub Core Competency



ENERGETIC MATERIALS BRANCH

EXPLOSIVES

- Hard Target Explosives
- Focused Energy Warhead Explosive
- Advanced Energetics
- Dense Metal Explosive
- Explosive Characterization, Processing & Experimentation
- MK-series Insensitive Munitions Technology



FUZES BRANCH

FUZES

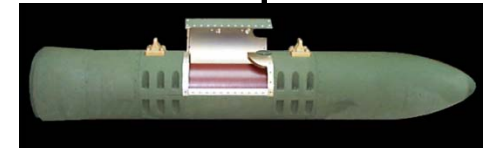
- Penetration Fuzing
- Point Burst Fuzing
- Advanced Initiation
- Battle Damage Sensing



DAMAGE MECHANISMS BRANCH

WARHEADS

- Focused Energy Warheads
- Unitary Warheads



ORDNANCE INTEGRATION BRANCH

WARHEADS

- Surface & Air Target Defeat
- Agent Defeat
- Hard Target Defeat
- Alternative Payloads

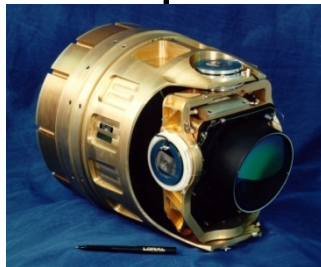


Advanced Guidance Division (RWG)



ADVANCED GUIDANCE DIVISION

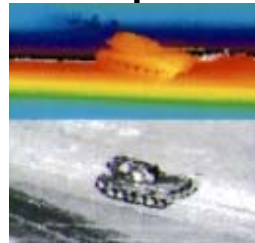
Core Competency
Sub Core Competency



SEEKERS BRANCH

SEEKERS

- LADAR
- Passive IR
- SAR
- Multispectral



SIGNAL & IMAGING PROC / ALGORITHMS BRANCH

PROCESSING / ALGORITHMS

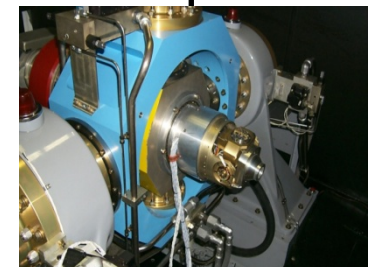
- Algorithms
- Processors



NAVIGATION & CONTROL BRANCH

NAVIGATION & CONTROL

- Tactical INS
- Anti-jam GPS
- Autonomous Control
- Cooperative Control



GUIDANCE SIMULATION BRANCH

ASSESSMENTS

- Synthetic Scene Generation
- Weapon Digital Simulation & Analysis
- Hardware-in-the-Loop Simulation



Assessment & Demonstrations Division (RWA)



ASSESSMENT & DEMONSTRATIONS DIVISION

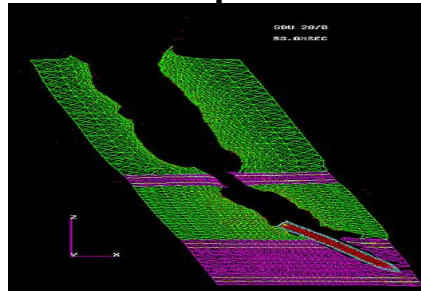
Core Competency
Sub Core Competency



LETHALITY & VULNERABILITY

ASSESSMENT

- Lethality / Vulnerability Methods
- Lethality / Vulnerability Analysis



COMPUTATIONAL MECHANICS

ASSESSMENT

- Computational Weapon / Target Solid Mechanics
- Computational Weapon / Target Fluid Mechanics



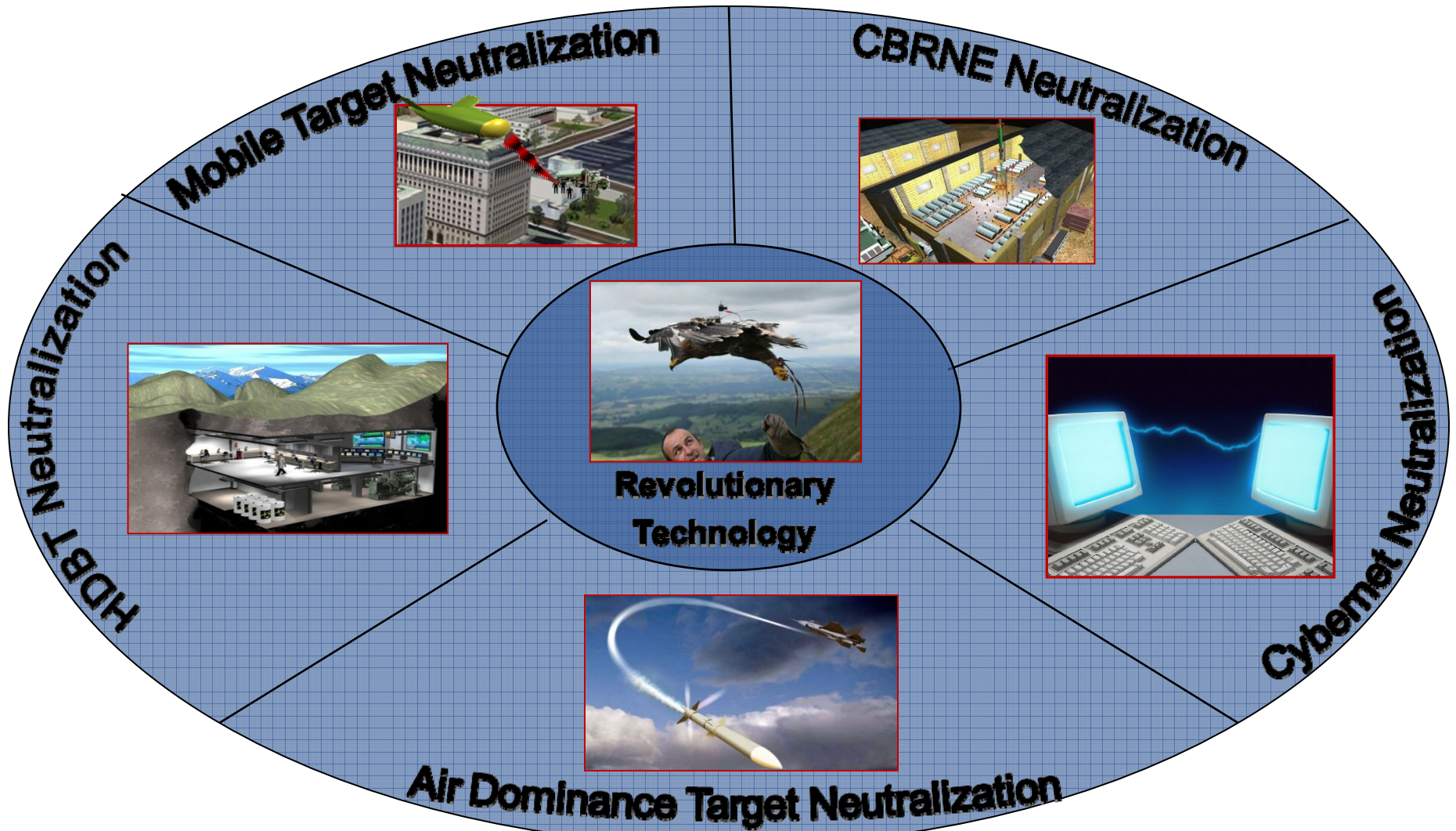
FLIGHT VEHICLES INTEGRATION

MUNITION INTEGRATION

- Subsystem Integration
- Integrated Technology Planning
- Micro Air Vehicles
- Weapon / Platform Integration



Capability Based Technologies





CBRNE Neutralization Technologies



Outdoor Validation Test



Indoor Baseline Test



Improved Diagnostic and Analysis Methods



Networked Munitions

Rigid Foams

Cooperative Robotics

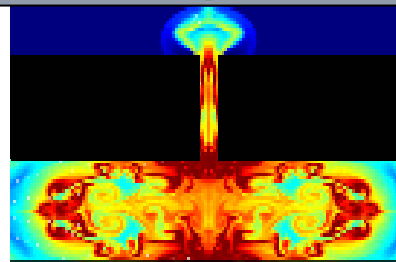
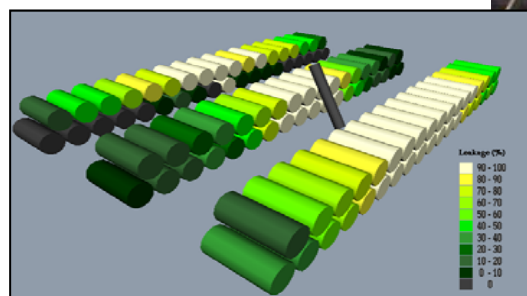


CBRNE Denial Concept Development



Weapon Borne Sensor Concept Evaluation

Agent In Target?



Development of Advanced Disruption Payloads



External Plume Neutralization



HDBT Neutralization Technologies



Boosted Penetrator Development

Demonstrate an ordnance package that can be internally carried on F-35, and survive high speed impacts and into reinforced concrete and function at the appropriate time.

Survive impact and intelligence to function at appropriate time



Penetrator & fuze/well design - Ensure fuze & explosive is provided a soft ride from impact to function

Fuzing

Conventional Survivable Ordnance Package

Energetics

Warhead case

M&S



High Speed Penetrator Development

Provide intercontinental, quick response in an anti-access/area denied environment to deliver effects on hard & deeply buried targets.

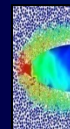


Hard Target Explosive Formulation, Characterization & Phenomenology

Multiscale, "Bottom Up" Modeling/Experiments: Material → System



Target-Case Interactions



New Nose Shapes



Energetics

Fuzing

High Speed Ordnance Package

M&S

Warhead case

Lab Reproduction of Harsh Environments



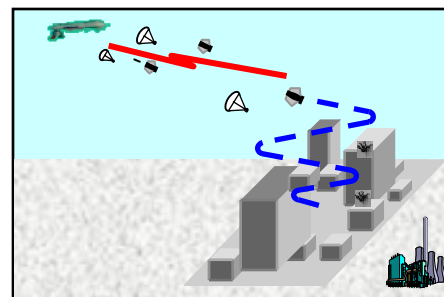
System Environment Characterization

Functional Defeat

Delivery System

Micro-Platform

Underground Facility with Critical Nodes

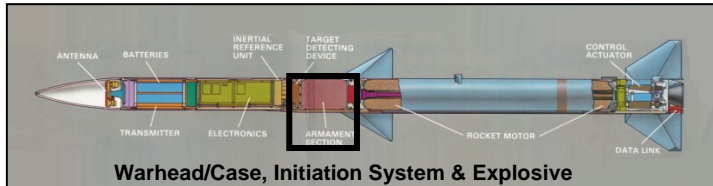


Concept Design and CONOPS

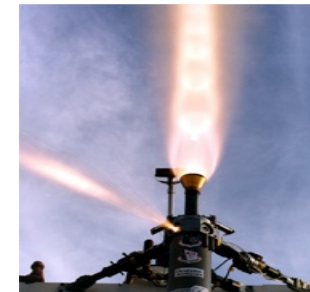
Difficult Target



Air Dominance Technologies



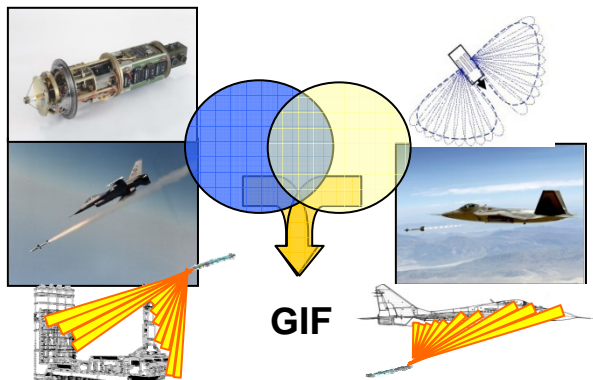
**Adaptable Multi-Point Initiated
Mass-Focusing, Enhanced
Lethality Warhead**



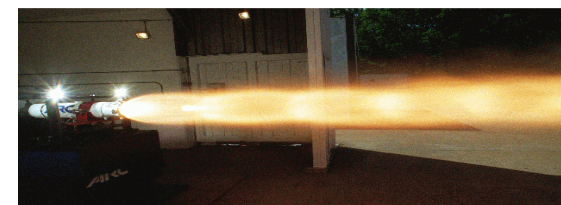
**High Maneuverability
Hybrid Aerodynamic Fin /
Reaction-Jet Control System**



**Potential Joint
Demonstration**



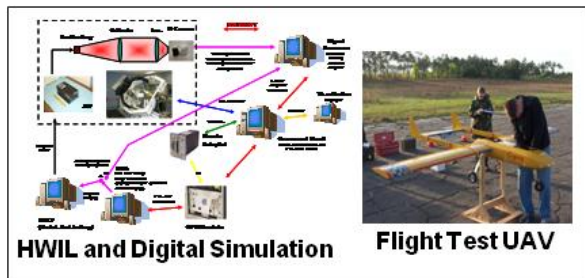
**Guidance Integrated Fuzing (GIF)
Weapon Seeker/Fuzing Integration
With Dual-Role Target Set Capability**



**Multi-Pulse Solid Rocket Motor &
Other Advanced Propulsion Concepts**



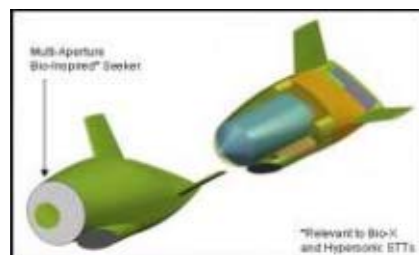
Mobile Target Neutralization Technologies



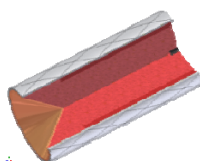
HWIL and Digital Simulation

Flight Test UAV

Micro- Munition Guidance and Control Test Bed



Precision Guided Submunition Airframe, Integration, & Demo



Precision Guided Submunition Warhead



Miniaturized Datalinks

Multi-Functional Materials & Structures

Vision Based Guidance

Precision Navigation & Timing

Fixed, Rotary & Flapping Wing Flight

Swarming, Cooperative Control, Collective Vision

Integrated Systems

Low Speed, Unsteady Aerodynamics

Complex Aero-elastic Structural Interaction

Weapon Data Links

Rapid Prototyping

Power Systems & Thermal Management

Miniaturized Payloads



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Cybernet Neutralization Technologies



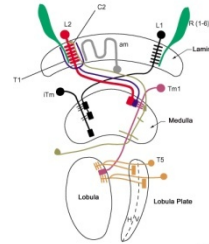
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Revolutionary Technologies



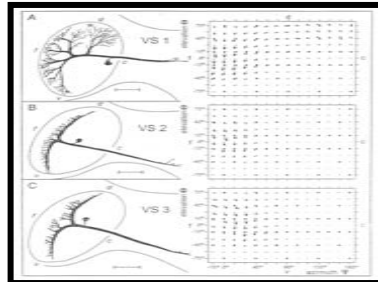
Compound Eye Modeling To Enable Designs Of Miniature Wide Field Of Regard Sensors



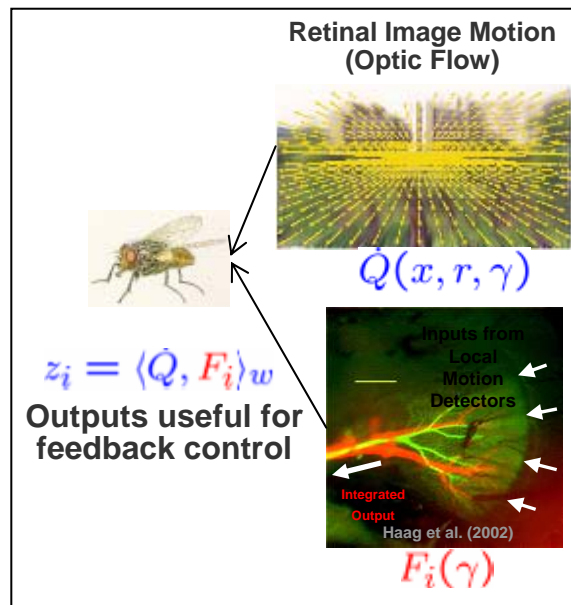
Translate Elementary Motion Detection Circuitry To Software Which Can Be Realized In Silicon



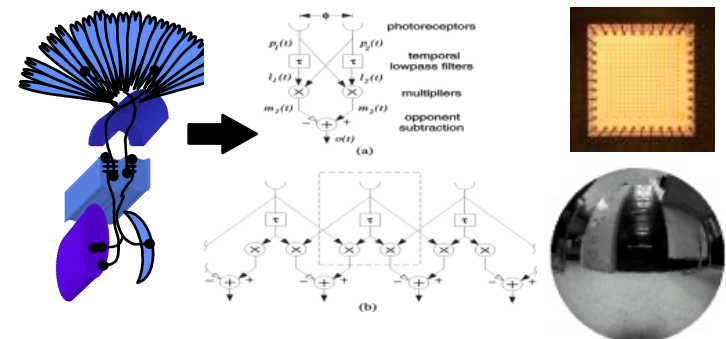
Understanding Raptor Flight Mechanics And Aerodynamics To Enhance The Agility Of Micro Munition Vehicles



Translate Optic Flow Algorithms To Software Which Can Be Realized In Silicon



Merge Control Theory With Biological Vision Motion Processing To Establish Merits Of Biology-inspired Concept For Collision Avoidance



Increase Processing Efficiencies For ATR And Terminal Guidance By Going From Biological Understanding To Electronic Implementation



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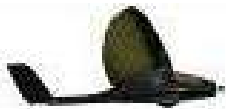
LEAD | DISCOVER | DEVELOP | DELIVER

Munitions Centric





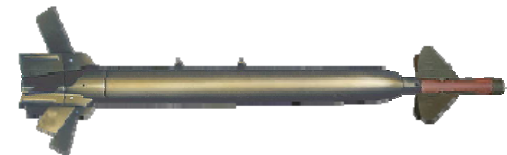
Strong Record of Demonstrating Integrated Capabilities



BATCAM



SDB I



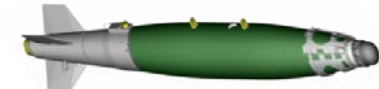
GBU-28 "Bunker Buster"



Shredder ATD



AMRAAM



JDAM



LGB



Crash-Pad



BLU-121



FLM



PAW



MOAB



HTSF



JASSM



Conclusion



- **Munitions technology investment gives high ROI**
- **Mid term munitions outlook characterized by**
 - **Increased lethality (per munition and airframe)**
 - **Persistence**
 - **Smaller Weapons potential for UAVs**
 - **Network centric / Cooperative control**
 - **Low Collateral Damage**
- **AFRL/RW relies on industry partnering to achieve our mission**
 - **R & D contracts goal: 50% of budget**
 - **Growing Revolutionary Technology Initiatives**



LEAD | DISCOVER | DEVELOP | DELIVER

AFRL Munitions Directorate

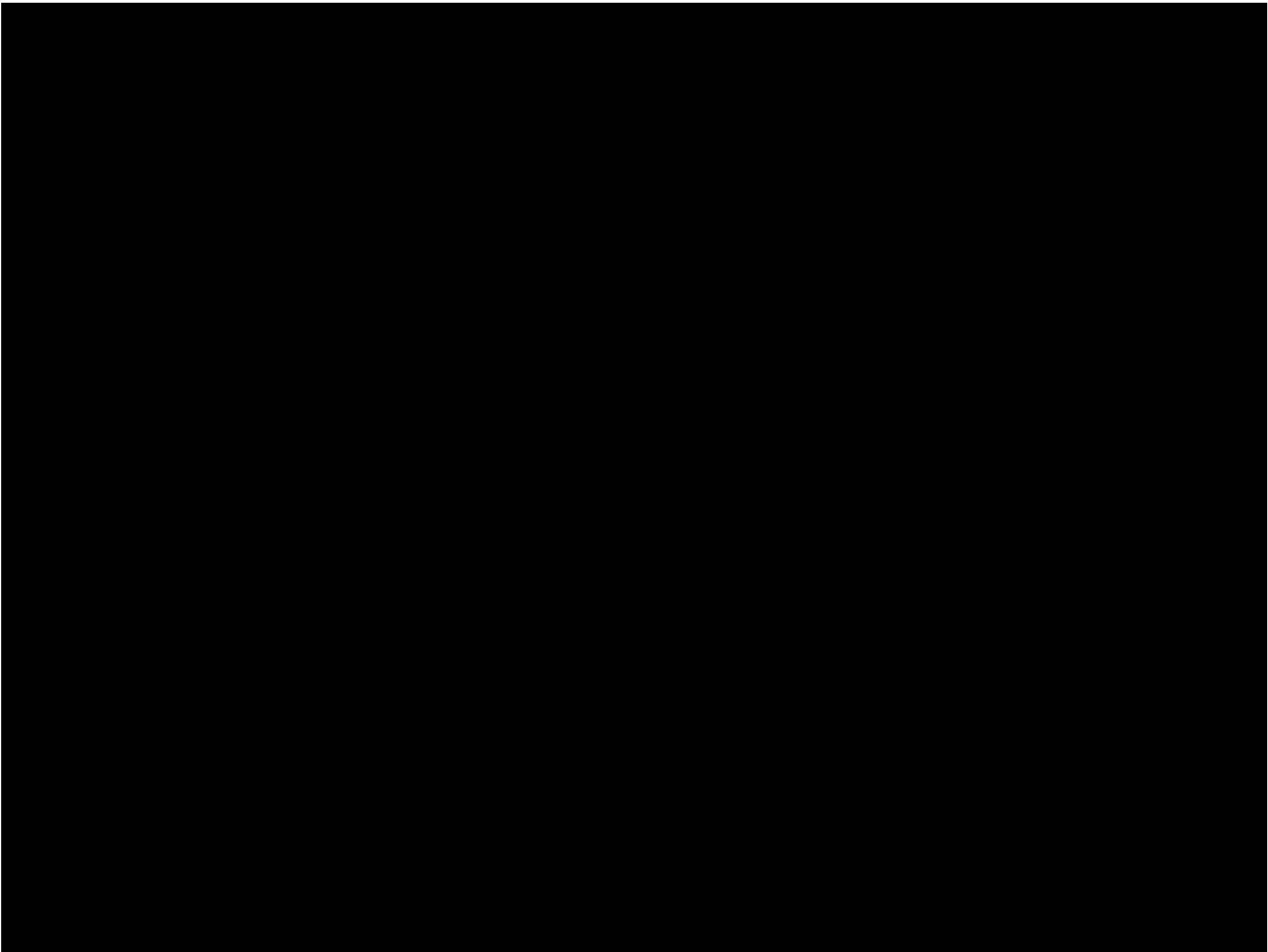


http://www.eglin.af.mil/afrl_rw/



We Deliver the Warfighter's Best Bang for the Buck !!

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Doing Business with AFRL/RW

- **Near Term Non-R&D Support Contract (Logistics Material Support Activity) Solicitation / Award 1Q09/ 2Q09**
- **Near Term R&D Contracts**
 - **External Plume Neutralization**
 - **Munitions Based Sensor / Seeker**
 - **CBRNE Denial Concept**
 - **Precision Guided Submunition Demo**
 - **Joint Dual Role Air Dominance Missile Demo**
 - **Armament Technologies BAA-RWK-08-001**
 - **Revolutionary Technologies BAA-RWK-08-002**
 - **Battlefield Airmen BAA-RWK-08-003**
- **SBIR Program – 13 Draft Topics**
- **Revolutionary Guidance & Ordnance Technology – White Papers & Proposals Anytime**



Directed Energy

High Power Microwave (HPM) Counter-Electronics

*Counter Electronics
1 minute approx
PA # AFRL/ RD 08-0041
Cleared for Release*

Enables attack on high value electronic targets with minimal collateral damage; virtually eliminating high post-conflict reconstruction costs!!!!

Warfighter Benefits

Unique capabilities that disrupt through destroy:

- Command, Control, and Communications (C³) Centers
- Integrated Air Defense Systems (IADS)
- WMD Production Facilities
- Cyber War Targets
- Enemy Infrastructures

Cannon Artillery and Mortar Precision Effects



Presented by: COLONEL Ole Knudson
Project Manager for
Combat Ammunition Systems

973 724-2003, ole.knudson@us.army.mil

"The presentation to the effect that disclosure of information does not imply any specific intent or commitment on the part of the U.S. to provide further information on the topic."



What Level of Precision is Needed?

- Urban Density Can Vary Widely Over Small Distances Between Terrain Elements
- Munitions with Varying Levels of Precision May Be Most Cost-Effective

Area Munition

120m Radius Circle

Open Area

Area Precision Munition

50m Radius Circle

Sparsely-Packed Urban

Densely-Packed Urban

Precision Guided Munition

10m Radius Circle

Cultural Area



Cannon Artillery and Mortar Precision Effects Capabilities



- All weather 24/7 continuously “loitering” precision capability
 - ✓ Responsively and precisely attack targets... can precisely “mass” fires
 - ✓ Minimizes collateral damage... “discretion” & “close” engagements
 - ✓ Inherent scalability with multiple shooters and multi-round missions
 - ✓ Dramatically reduced logistics burdens (less qtys and transport/storage)

- Employed with current cannon artillery & mortar systems and structure... & accurate targeting systems (FS3, LLDR, PSS-SOF)
 - ✓ Easily additive to current systems and capabilities... “compatibility” is key
 - ✓ Maintains current Smoke & Illum capabilities
 - ✓ Maintains area fire & suppressive fires capabilities... “precise” area fires?

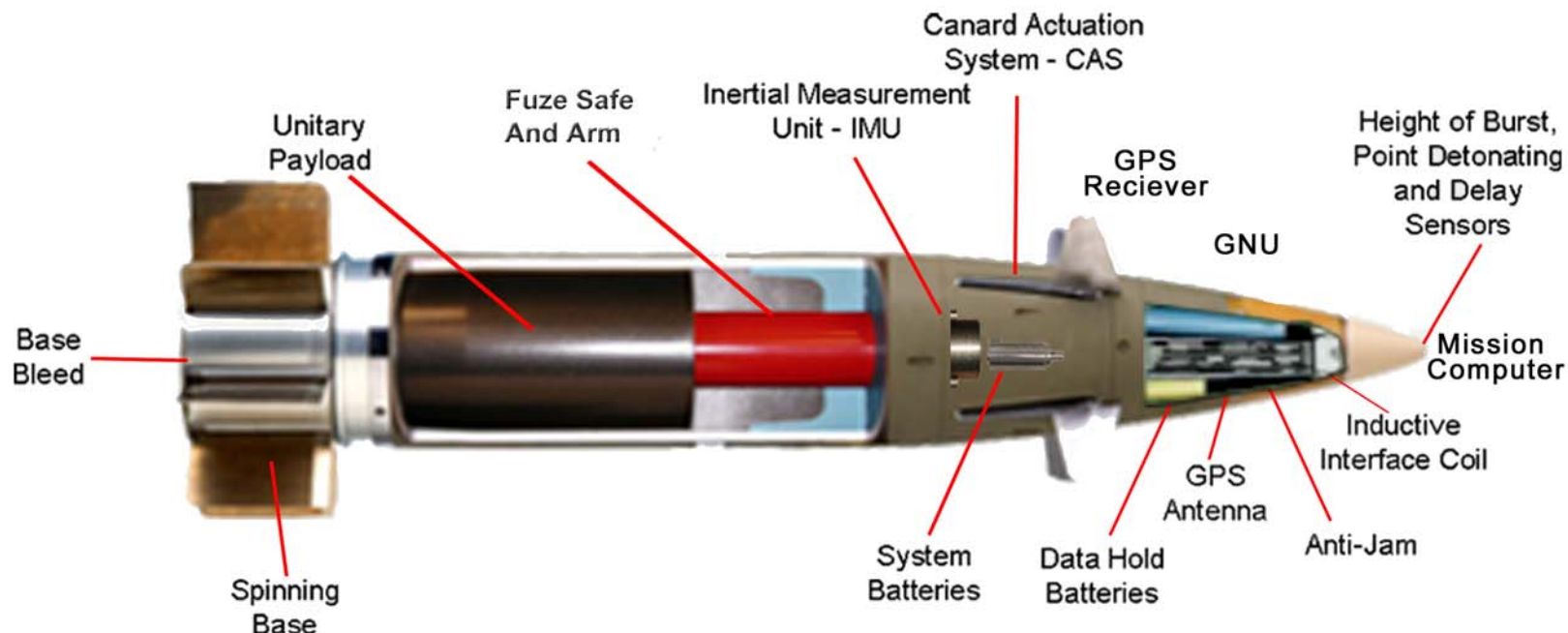


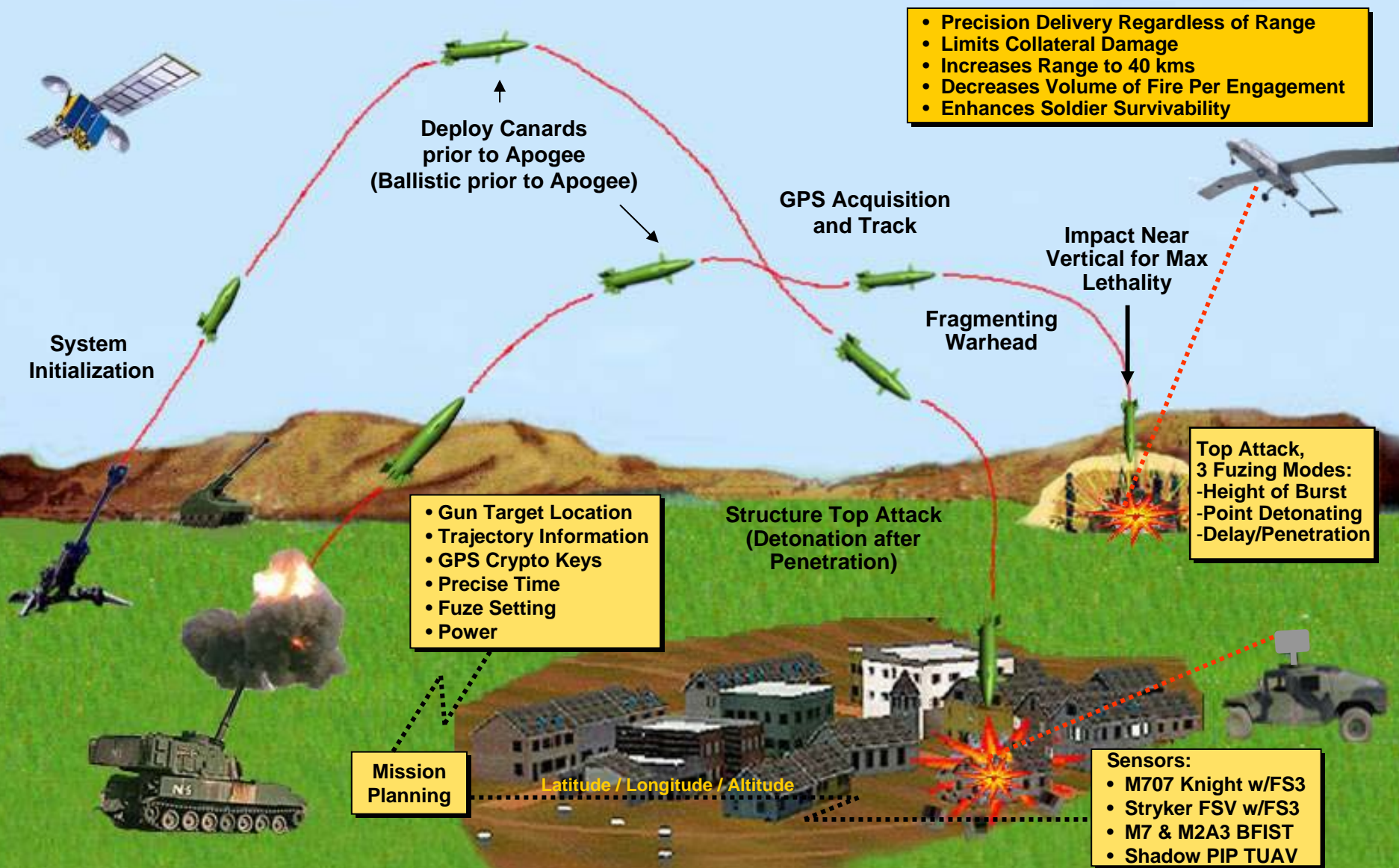
XM982 Excalibur



System Characteristics/Description:

- ✓ Precision Guided 155mm Cannon Ammunition (CEP < 10m)
- ✓ Fin Stabilized, Gliding Air Frame
- ✓ All Weather, Day/Night, Fire & Forget, Urban/Complex Terrain
- ✓ Compatible with NLOS-C, Paladin and LW155 Howitzer Platforms
- ✓ One Meter Length / 106 lb







Excalibur Video





Precision Guidance Kit (PGK) 155mm Projectile Accuracy

- Increased effectiveness (kills targets quicker)
- Increased stored kills per platform
- Reduced collateral damage
- Reduced logistics burden
- Closer support of friendly troops

CEP vs. Range

w/o PGK

95m

115m

140m

275m

< 50m

30 km

< 50m

25 km

< 50m

20 km

< 50m

15 km

w/PGK

Paladin
M109A6

LW155
M777

Paladin
M109A6

LW155
M777

PGK Increment 1 Provides
CEP Accuracy of < 50 Meters



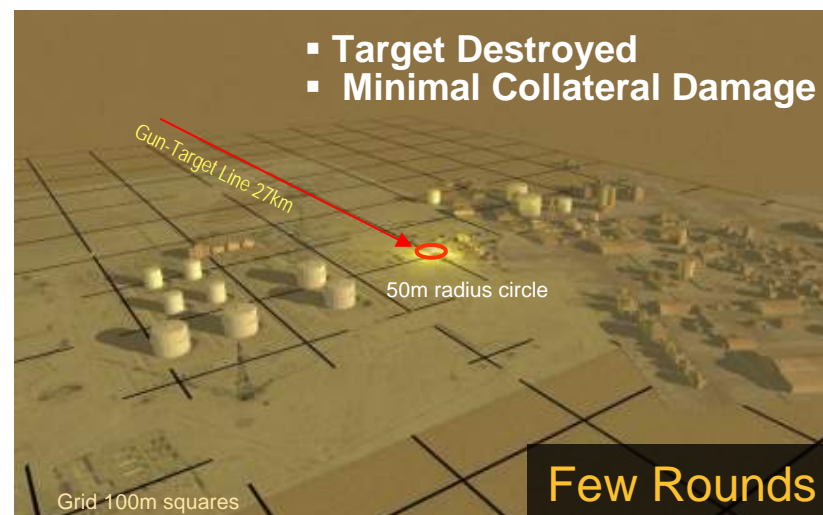
Operational Benefits



Today's Capability: 183m CEP*



PGK: $\leq 50m$ CEP



* M109A6 (Paladin) at 27km: 155mm (HE) M549A1

- Improves Accuracy – Significantly Reduces Ballistic Dispersion
- Significantly Decreases the Time Needed to Achieve Desired effects
- Minimizes Collateral Damage and Enables Closer Support to Friendly Troops
- Increases Number of Kills per Basic Load of Ammunition
- Greatly Reduces Logistics Burdens



PGK Design (Increment 1)



- Fits in standard 155mm High Explosive artillery projectile fuze wells (deep intrusion)
- GPS guidance (incorporates SAASM)
- 20 Year Storage Life (no battery)
- Proximity & Point Detonating Fuzing



2007 Tech Demo Firing



PGK Video



PGK
Precision Guidance Kit




Emerging Needs/ Future Requirements



- IBC T Organic Precision Requirements
 - ✓ 40 Plus IBC Ts within Army structure...have mortars & 105mm
 - ✓ PGK-2 is funded...implemented with 105mm digitization
 - ✓ Need for organic very responsive precision with <10m CEP
- “Cheap” or “Very Affordable” Precision
 - ✓ Key technologies... GPS, Fuzing, Power, AJ, & SALs
 - ✓ ARDEC/ARL CRADA efforts to mature components and integrated concepts...applicable to artillery and mortars
 - ✓ Several Industry efforts ongoing...will enable competition
 - ✓ Wider use in training...confidence, proficiency, and quantities

Is Very Affordable Precision “Coming Soon”?



Joint Strike Fighter Program Update

CAPT John “Snooze” Martins
Director, Air Vehicle

F-35 Lightning II Program Office



Key Messages

- **Vision:** Deliver and sustain the most advanced, affordable strike fighter aircraft to protect future generations worldwide.
- **Mission Statement:** Be the model acquisition program for joint service and international cooperation.
- **Program Priorities:**
 - Finish Development and Deliver Essential Warfighting Capability on Schedule
 - Maintain Affordability as Key Tennant of the Program
 - Implement Sustainment Via Performance Based Outcomes
 - Preserving the Partnership

Agenda

- Background
 - Program
 - Variants
- Air Vehicle
 - Air Frame
 - Sensors
 - Data Links
 - Displays
 - Weapons

***Lethal, Survivable, Supportable, Affordable
and Connected Node on the Joint Coalition Battlefield***

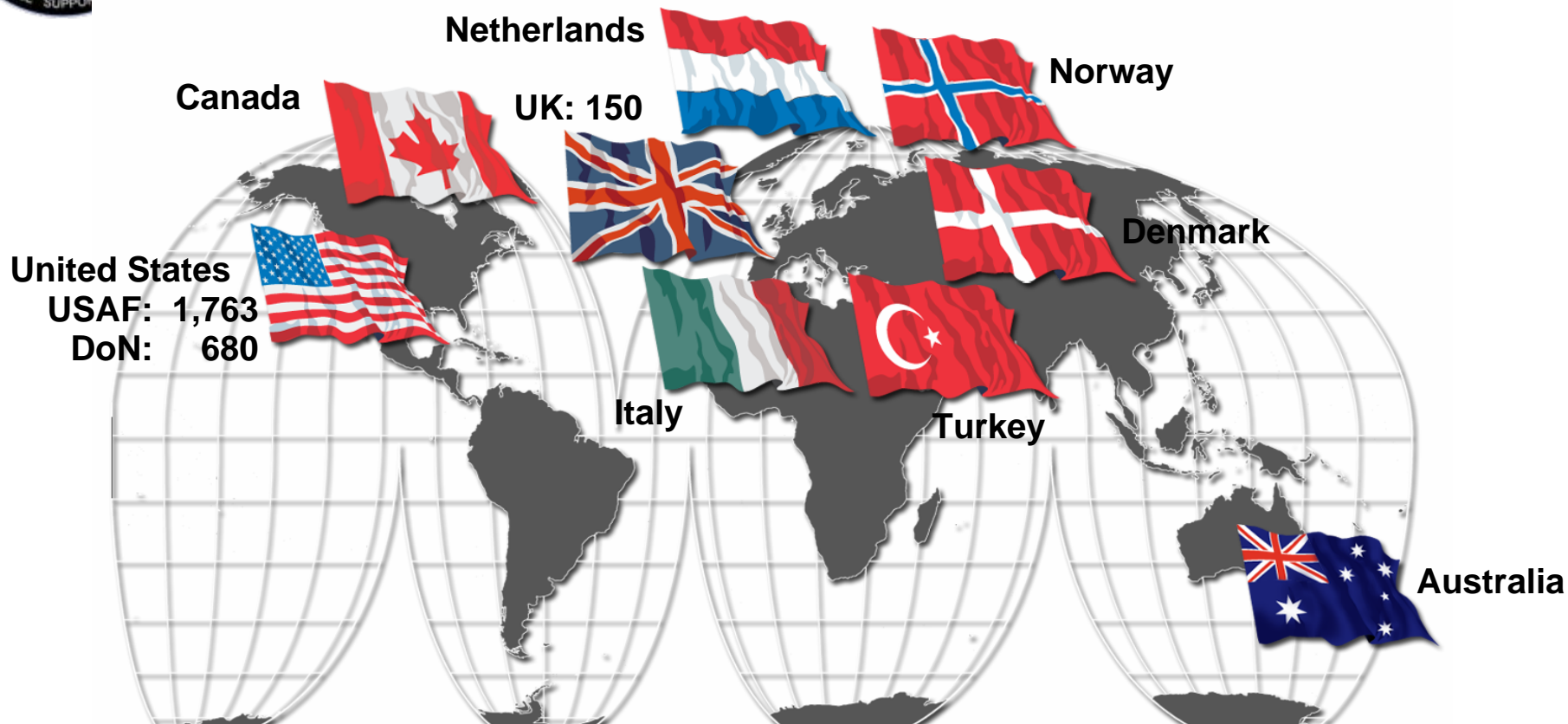


Security Guidelines

- Slides and Discussions are UNCLASSIFIED



Service & International Needs



- **USAF:** Multi-role (primary air-to-ground) fighter to replace F-16 & A-10 & to complement F/A-22
- **USMC:** Multi-role, short takeoff, vertical landing strike fighter to replace AV-8B & F/A-18C/D
- **USN:** Multi-role strike fighter to complement the F/A-18E/F
- **UK (RN and RAF):** Supersonic replacement for Sea Harrier and GR-7

2,593 US/UK JSFs

> 2,000 International JSFs



Lockheed Martin JSF Team

NORTHROP GRUMMAN

- Center Fuselage
- Weapons Bay Door Drives
- Arresting Gear
- CV Control and Test
- Radar
- Software
- LO Support System
- Training Courseware and Management Systems

BAE SYSTEMS

- Aft Fuselage
- CV Wing Fold
- Fuel System
- Crew Escape
- Life Support
- EW System
- U.K. Support Center
- Throttle/Side Stick
- Horizontal/Vertical Tails
- Flight Control Computer
- STOVL Control and Test
- U.K. Rqts/Stores/SW

LOCKHEED MARTIN

Prime Contractor

- Air System Verification
- System Integration
- Mate Through Delivery
- Edges & Control Systems
- Autonomic Logistics
- Mission Systems
- Vehicle Systems
- Training System
- Forward Fuselage
- Wing

A Highly Integrated Best Value Team



F-35 Global Supply Sources

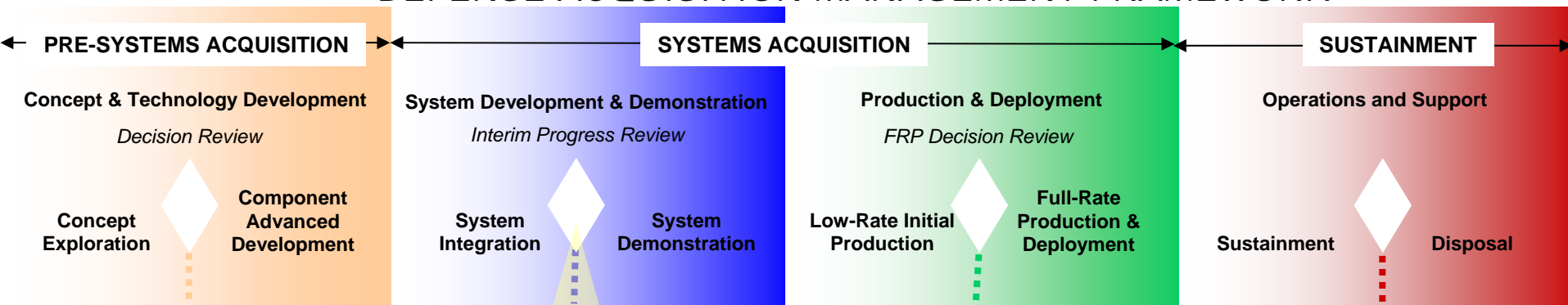




JSF System Development and Demonstration Phase

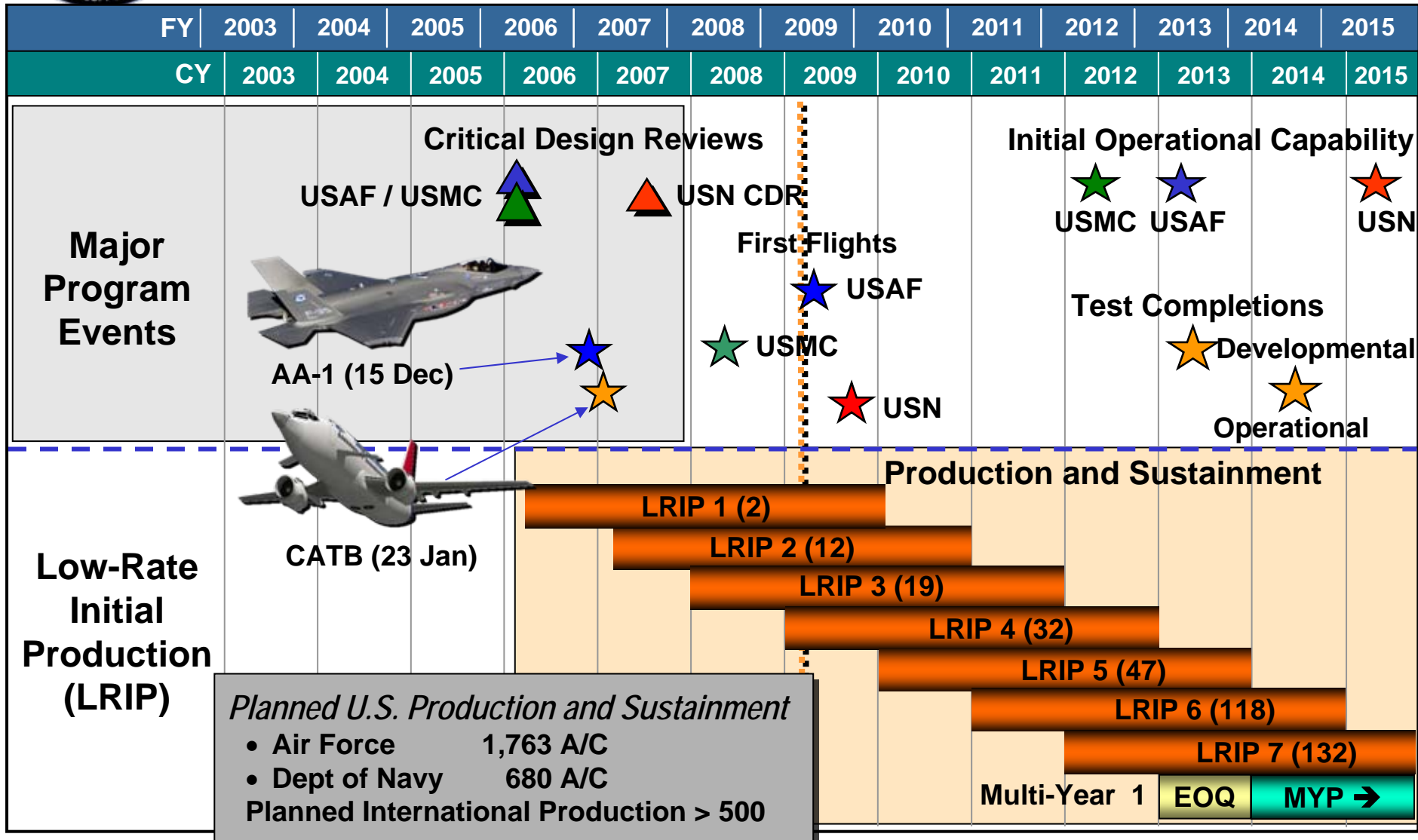


DEFENSE ACQUISITION MANAGEMENT FRAMEWORK





JSF Master Schedule

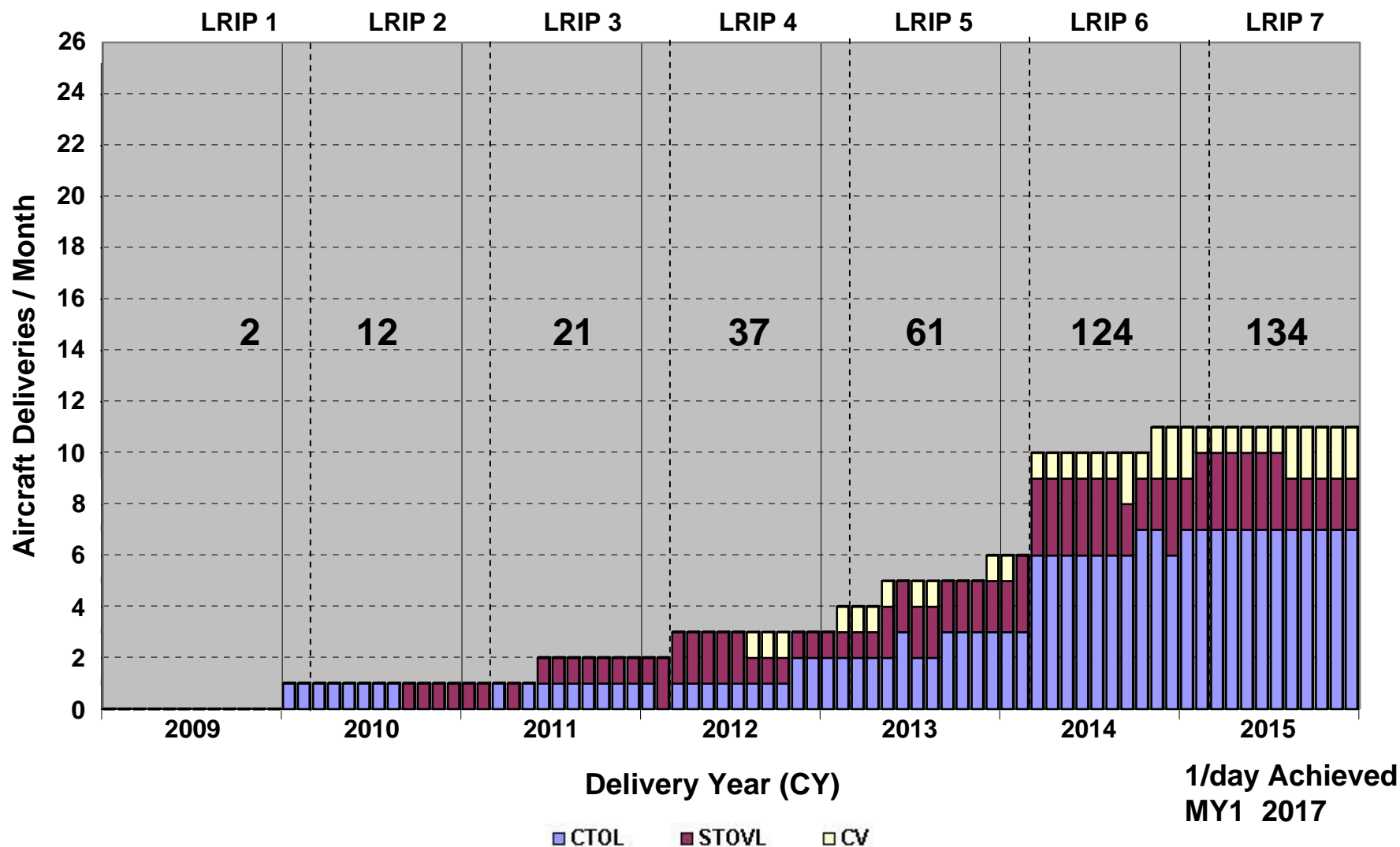


EOQ = Economic Order Quantity

MYP = Multi-Year Procurement



LRIP Deliveries by Variant





Major Accomplishments



Flight Test

- AA-1: - 62 Total Flights, 99.9 flight hrs
 - Significant risk reduction (Fuel Dump, Flight Controls, Electrical System, PTMS)
 - Successful Edwards Deployment (Air Starts, High Fidelity Noise Data, High Sortie Completion Rate)
- CATB: - First Flight: 23 Jan 07
 - 37 Total Flights /105.7 Total hours/13.5 Mission Systems hours (INS/GPS integration flights)
- BF-1: - First Flight 11 Jun 2008
 - 14 Flights, 13.3 flight hrs (Initial Hover Pit, STOVL Doors Open in Flight, Electrical System, IPP Test)
- BF-2: - First Flight 25 Feb 09



Production

- All 19 SDD and 2 LRIP Aircraft in production

Development

- Autonomic Logistics Information System Operational and Supporting AA-1
- 61% of all JSF software complete and in test
- All three variants tracking to NTE weight growth forecasts and meeting KPPs

Subsystems

- All mission Sensors Flown on Test Beds (Radar, DAS, EOTS, EW/CM)
- Radar Blk 0.5 software tracked open air targets over Fort Worth from the lab and displayed on PCD
- Electro-Optical Targeting System Planar Array Sensor re-designed and delivered to LM

F135

- 10,281 total hours on 13 engines (as of 6 Oct 08)
- Supporting AA-1 and BF-1 flight test
- STOVL retrofit engine on track for Jan 09 Delivery

F136

- 712 total hours on 2 engines (002 and 003) (as of 6 Oct 08)
- First Engine to Test (FETT) Engine 004 successful light off





Multi-Service Design

Carrier Variant (CV)

Probe and Drogue Refueling (Basket)

Strengthened Landing Gear and Tailhook

Wingfold and Ailerons Added

Probe and Drogue Refueling (Basket)

Lift Fan

Larger Wing and Horizontal Tail Area

Centerline Gun Pod with 25mm Gun

Roll Posts

Conventional Take-Off and Landing (CTOL)

In-Flight Refueling Door (Boom)

Internal 25mm 4-Barrel Gattling Gun

AA-1 First Flt 15 Dec 06

3-Bearing Swivel Nozzle

Short Take-Off and Vertical Landing (STOVL)

STOVL Doors inflight

BF-1 First Flt 11 Jun 08

IBIT



CTOL Comparison



Length	49.7 ft
Span	31 ft
Wing Area	300 ft ²
Internal Fuel	7,162 lb



Length	50.5 ft
Span	35 ft
Wing Area	460 ft ²
Internal Fuel	18,307 lb



Length	62.1 ft
Span	44.5 ft
Wing Area	840 ft ²
Internal Fuel	



STOVL Comparisons



Length	56 ft
Span	37.4 ft
Wing Area	400 ft ²
Internal Fuel	10,800 lb
Spot factor	1.0



Length	50.5 ft
Span	35 ft
Wing Area	460 ft ²
Internal Fuel	13,400 lb
Spot Factor	1.09



Length	47.4 ft
Span	30.3 ft
Wing Area	239 ft ²
Internal Fuel	7915 lb
Spot Factor	.82



Carrier Comparison



Length	56 ft
Span	37.4 ft
Wing Area	400 ft ²
Internal Fuel	10,800 lb
Spot Factor	1.0



Length	50.8 ft
Span	43 ft
Wing Area	620 ft ²
Internal Fuel	19,145 lb
Spot Factor	1.11

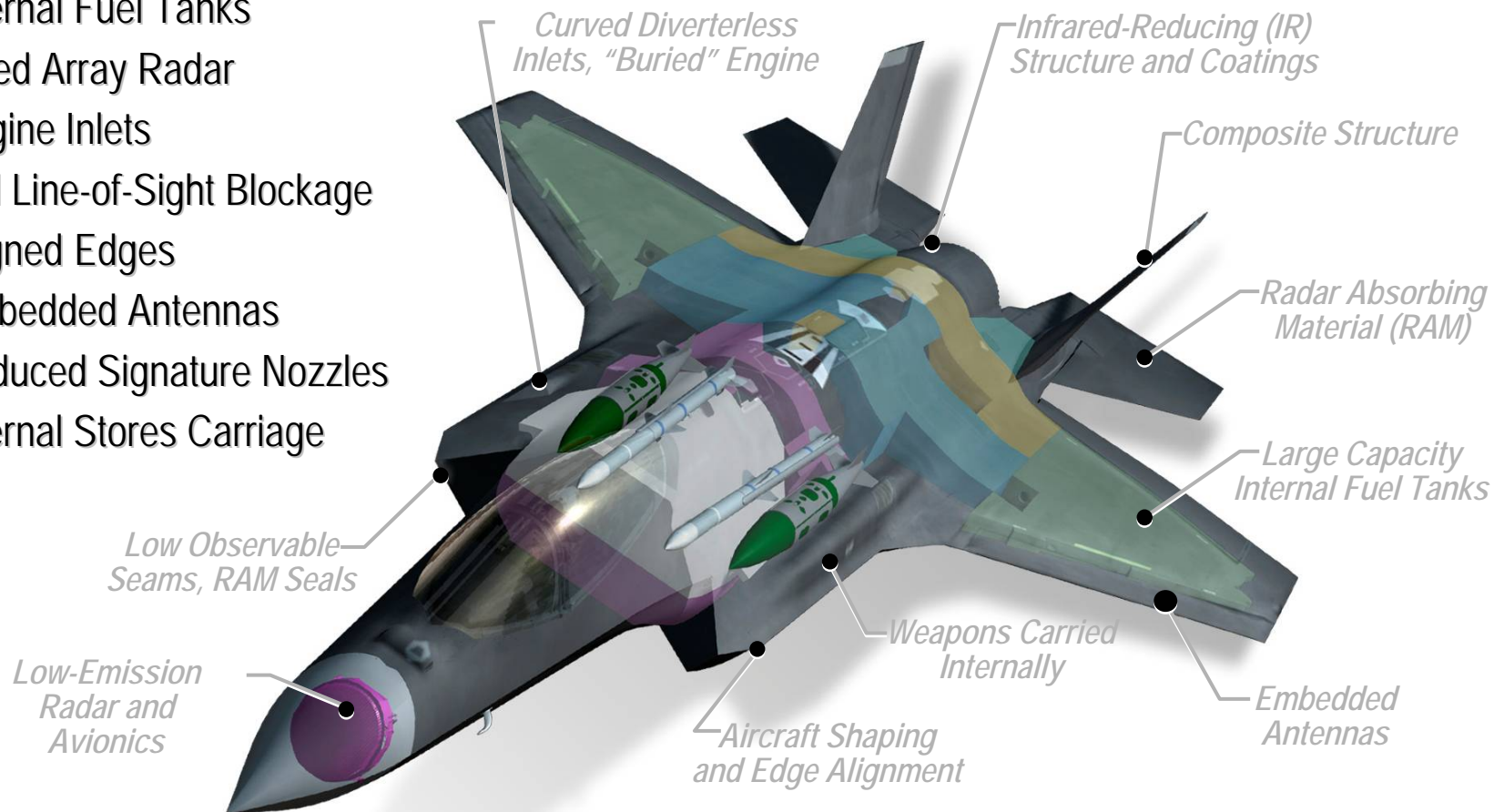


Length	60.38 ft
Span	42 ft
Wing Area	500 ft ²
Internal Fuel	14,708 lb
Spot Factor	1.24



VLO Stealth Design

- Internal Fuel Tanks
- Fixed Array Radar
- Engine Inlets
- Full Line-of-Sight Blockage
- Aligned Edges
- Embedded Antennas
- Reduced Signature Nozzles
- Internal Stores Carriage



Fundamental 5TH Design Features Can Not Be Retrofitted



JSF Engine Interchangeability

- **Physically** and **Functionally** Interchangeable
- Any Aircraft Able to Use Any Engine
- Common JSF Autonomic Logistics System Interfaces



PRATT & WHITNEY F135



**GE AIRCRAFT ENGINES/
ROLLS ROYCE F136**



***JSF Engines - - Common Core for Aircraft
Variants, Competition in Production***





F-35 Integrated Avionics



Full Spherical Coverage by RWR & Distributed Aperture System (DAS)

Electro-Optical Targeting System (EOTS)
• **Saberliner**

Active Electronically Scanned Array (AESA)

Radar

• **BAC-111**

Electronic Support Measures

Emitter Locating
• **Sphyræna ESM Flight**

All Aspect Stealth – Low Observable

360° Coverage

RWR Antennae

DAS Apertures

Mission Systems Test

- **CATB 1st Flight Dec 07**
- **BF-4 1st Flight Mar 09**

Network Connectivity

- Link-16, VMF, MDL
- SINCGARS
- Wide Band Tactical (TTNT/WNW)
- NEW
- SATCOM (Voice/Data/IBS)





Validating Mission Systems in Flight

QF-4

EO DAS



Sabreliner

EOTS



BAC-111



Radar, EO DAS, INS, GPS

**Systems
in Test**

Flight Hrs

**Lab
Hrs**

HMD	97.6 Hrs (AA-1/BF-1)	14456
Radar	227 Hrs (BAC-111) 1 Hr CATB	18000
EO DAS	245 Hrs (F-16, BAC-111, QF-4) (CATB – 1Q '10)	25282
EOTS	152 Hrs (Sabreliner) (CATB – 4Q '09)	10680
Integrated CNI	109 Hrs INS/GPS: AA-1/BF-1 126 Hrs INS/GPS: BAC-111 35 Hrs RALT 20 Hrs CATB	12000 (Supplier) 8155 (MSIL)
EW/CM	101 Hrs (CATB – 1Q '09)	28842

F-16



DAS, EW CM

F-35 AA-1



HMD



MFD

CATB

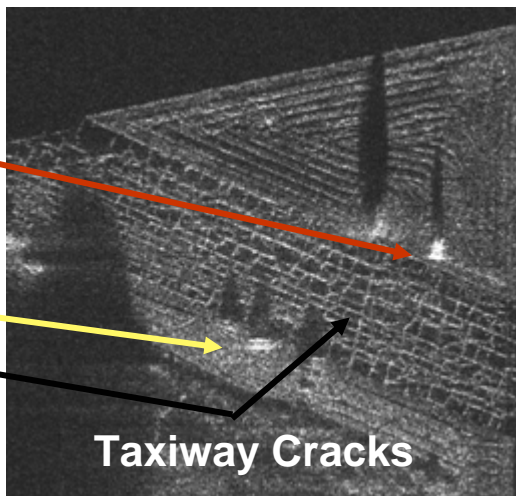
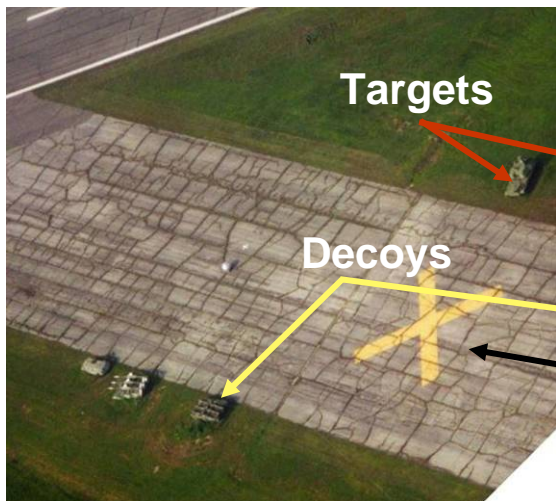


Fully Integrated MS

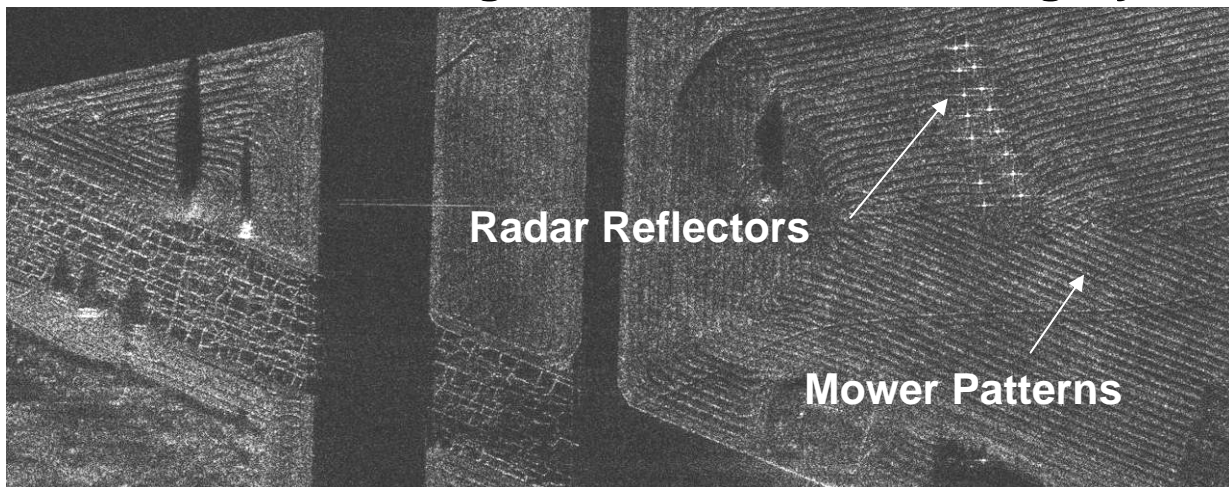




APG-81 Advanced Electronically Scanned Array (AESA) Radar

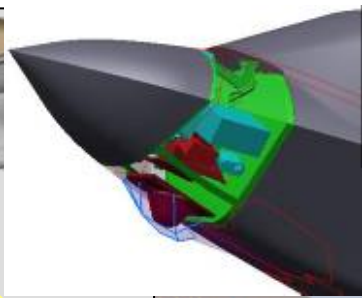
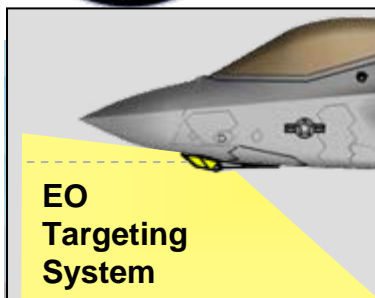


APG-81 Ultra High Resolution SAR Imagery





Electro Optical Targeting System Operational Capabilities



- Internally Mounted

- Long Range, High Resolution

- NAVFLIR, Targeting FLIR, IRST Functions

- Digital Continuous Zoom

Long Range A-A IRST



Air-to-Surface Targeting FLIR



Laser Designation



Laser Spot Tracker

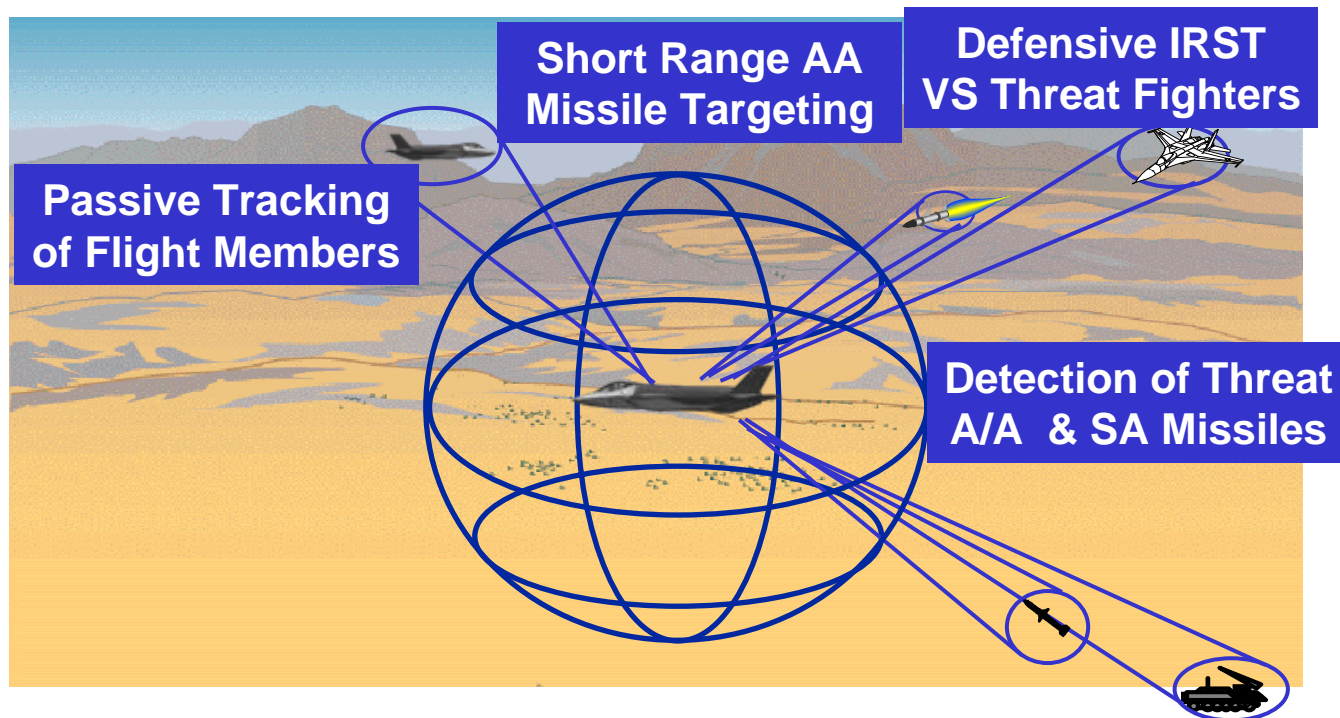


The Advanced EOTS Provides Passive Multi-Spectral A/A and A/G Capabilities As Well as Enhanced A/G Target ID Capability



Distributed Aperture System (DAS)

- Total Situational Awareness Around Aircraft
- Track Wingmen & Threat Aircraft
- Missile Launch Detection
- NAVFLIR Functions
- Integrated with HMD

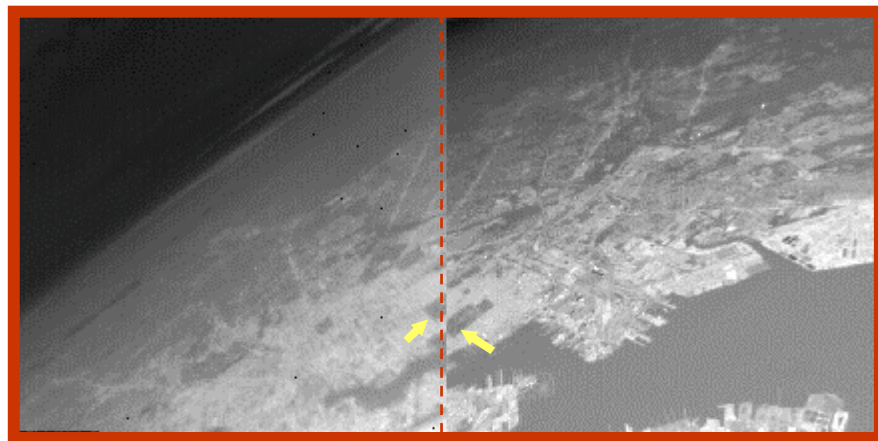




EO Distributed Apertures Flight Demonstration



JSF Generates 6 Continuous Images....



***....Seamlessly Stitched Together
For Full 360 Degree Imaging
Capability***

Aircraft Communications Capability

- ❖ Funded
- ❖ Planned

Voice Communications

- ❖ UHF/VHF Clear/Secure
- ❖ HAVEQUICK
- ❖ Survival Radio Comm
- ❖ Link 16
- ❖ MADL
- ❖ SATCOM (DAMA/MUOS)

Navigation/Landing Aids

- ❖ INS
- ❖ GPS
- ❖ ILS
- ❖ TACAN
- ❖ ICLS
- ❖ JPALS (partial)
- ❖ JPALS (full)

Identification/Surveillance

- ❖ Mark XII Transponder and Interrogator
 - Modes 1, 2, 3/A, C, 4, 5
- ❖ Mode S (transponder only)
- ❖ Mode S (interrogator)

Data Communications

- ❖ Link 16 (J-Series)
- ❖ VMF (K-Series)
- ❖ MADL (intra-flight data link)
- ❖ P5 CTS
- ❖ IBS (TIBS/TDDS)
- ❖ Streaming Video (Rover format)
- ❖ Tactical Wide Band IP based DL
- ❖ SATCOM (DAMA/MUOS)

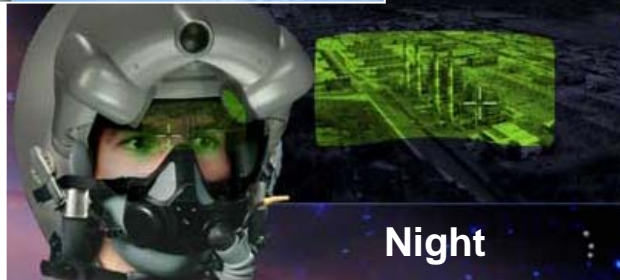
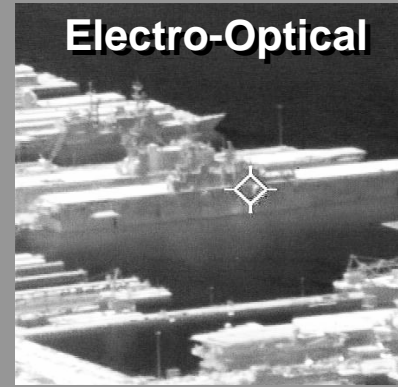
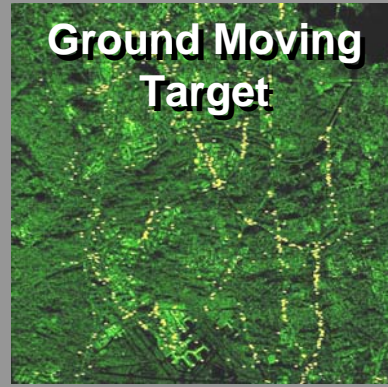
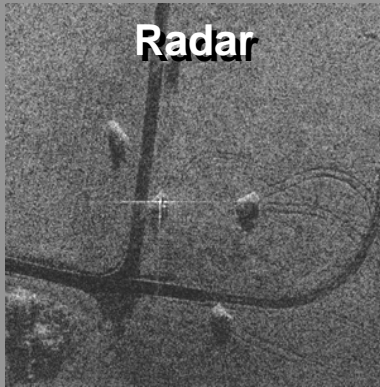
Weapons

- ❖ X-band (AIM-120, AIM-9X)
- ❖ NEW (Link-16 network enabled weapons: JSOW, SDB-II)





Enhanced Sensor Fusion & Information Displays Total Situational Awareness



**Fused Tactical
Information Managed &
Displayed To The Pilot**





JSF Crew Station

8 by 20-inch Contiguous Display

Wide FOV HMD With Virtual HUD and All-View DAS Imagery

3-D Audio and Voice Control
(Software Test Report: 98% accuracy for US, UK, Canadian, Dutch, and Danish speakers. Italy, Turkey, Australia less accurate)

Innovative STOVL Controls

Integrated Life Support System Provides Interface to Any Customer Pilot Flight Equipment

Next-Generation Escape System With Vectoring Thrust and Auto-Ejection (600kts/103lbs)

New COTS Technologies and an Innovative Approach to Pilot-Vehicle Integration Produce a Capable and Flexible Cockpit

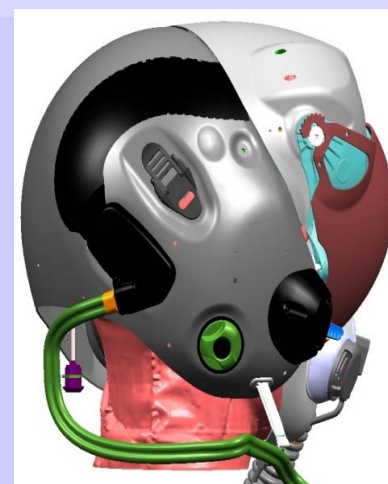
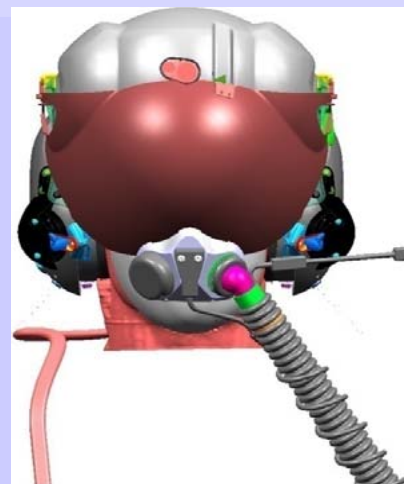




HMDS

DESCRIPTION

- Provides head protection, virtual HUD, video stream and night camera for F-35 pilots
- HMDS components include
 - Display Management Computer (DMC/H)
 - Head-tracker Transmitter Unit (HTU) – on seat
 - Fixed Camera – above glare shield
 - Helmet Assembly Unit (HAU) – helmet, ANR ear cups, HVI and modified MBU-23/P
 - Helmet Display Unit (HDU) – display source, optics, visors (2), head-tracker receiver unit (HRU)





Panoramic Cockpit Display

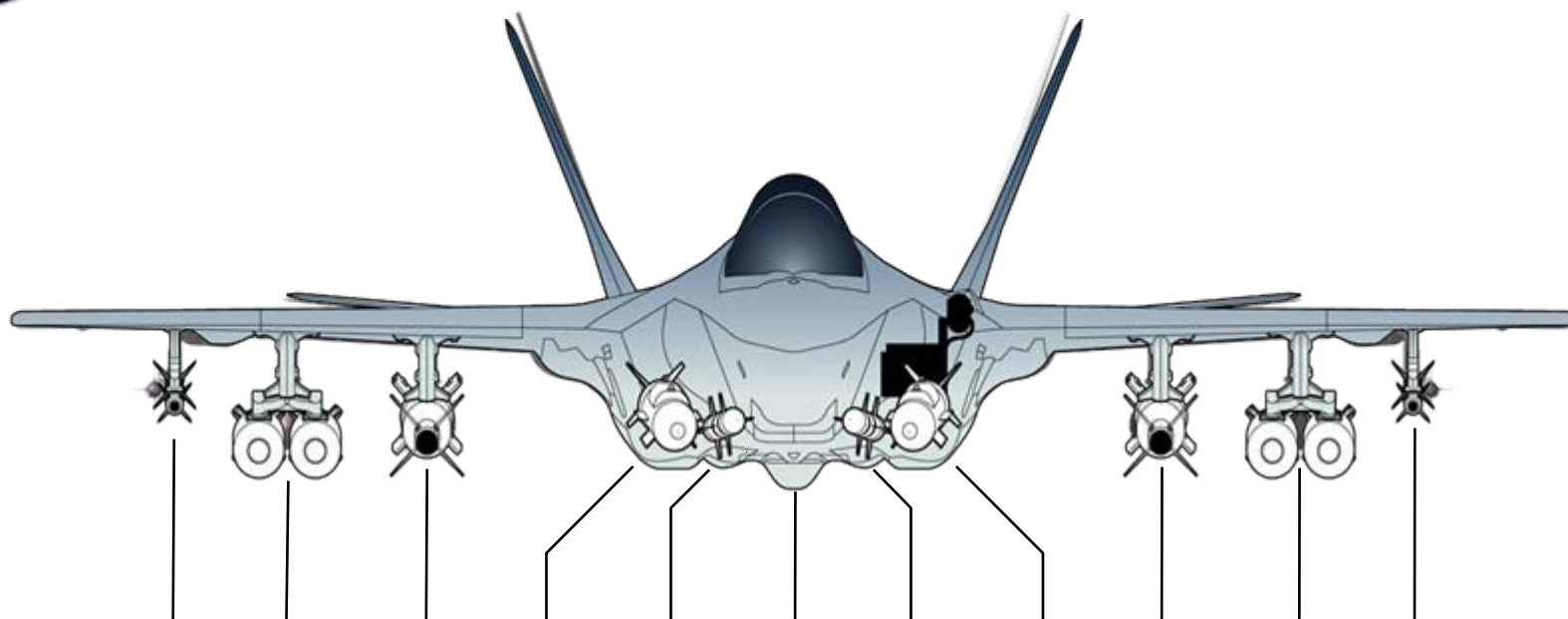
DESCRIPTION

- 8 x 20 AMLCD Head Down Display
- Single Piece of Glass
- 12 operator selectable portals, or two 7x10 portals
- Touch Screen Interface
- Provides virtual Keypad for system control
- Function Action Bar (FAB) for time critical system controls





Weapons Stations



Station	11	10	9	8	7	6	5	4	3	2	1
Store	A/A	A/A, A/S	A/A, A/S	A/A, A/S	A/A	A/S	A/A	A/A, A/S	A/A, A/S	A/A, A/S	A/A
Weight	300	2,500*	5,000	2,500*	350	1,000	350	2,500*	5,000	2,500*	300

- Over 18,000 Lbs Ordnance Capacity
- Non-pyrotechnic Suspension and Release

* STOVL Stations 2/10 & 4/8 Reduced to 1,500 (SWAT)



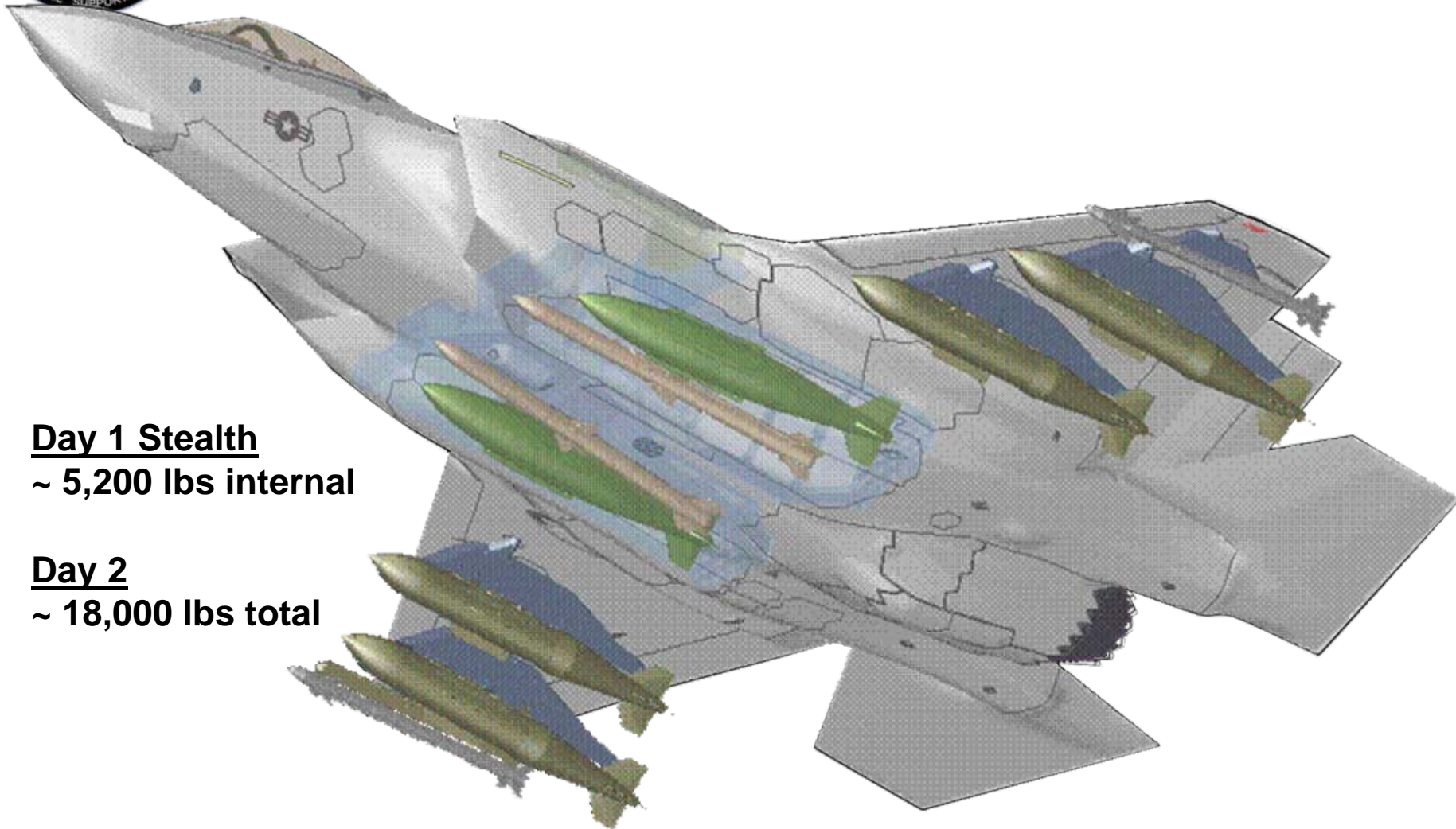
CTOL Loading

Day 1 Stealth

~ 5,200 lbs internal

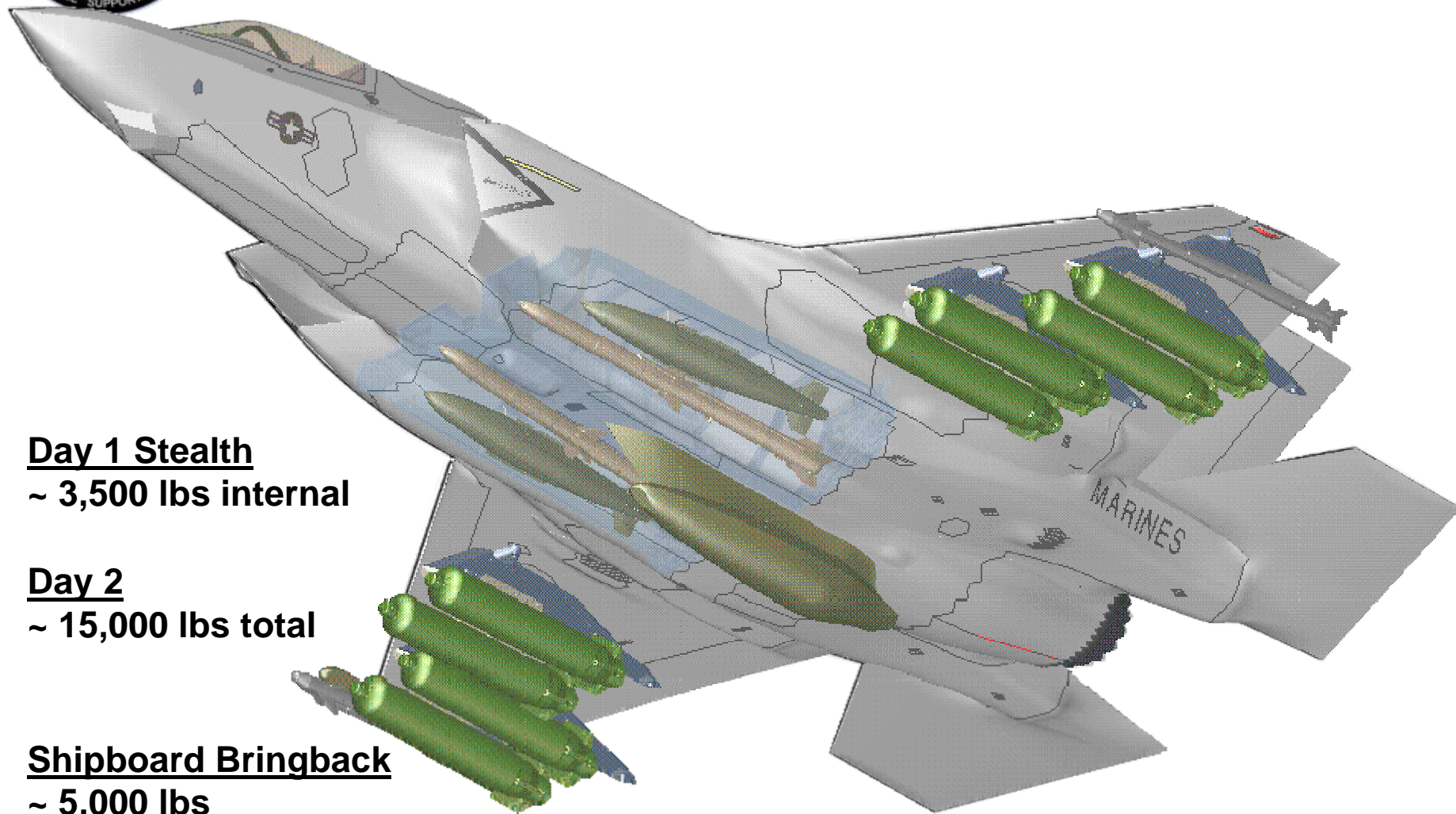
Day 2

~ 18,000 lbs total





STOVL Loading



Day 1 Stealth
~ 3,500 lbs internal

Day 2
~ 15,000 lbs total

Shipboard Bringback
~ 5,000 lbs

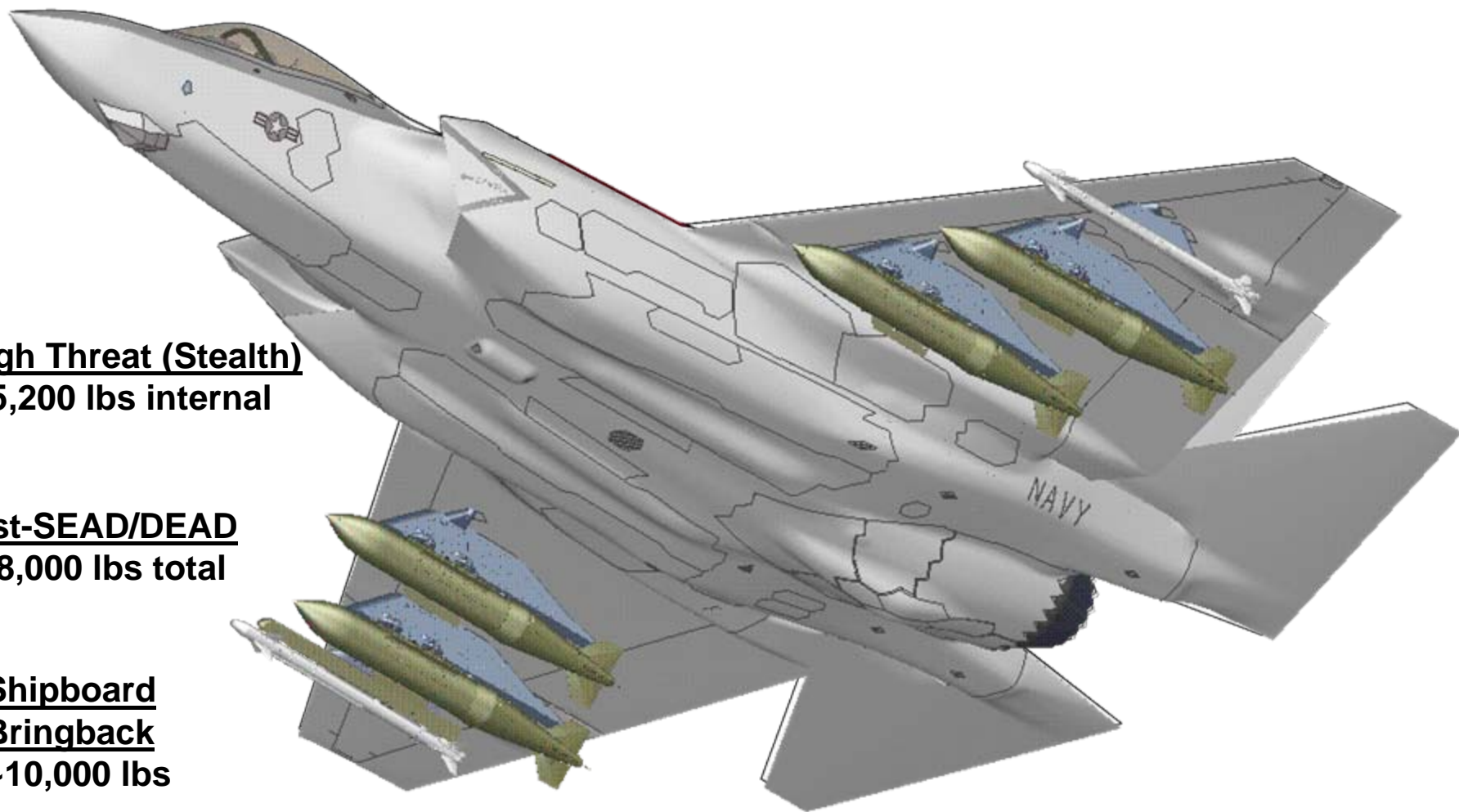


CV Loading

High Threat (Stealth)
~ 5,200 lbs internal

Post-SEAD/DEAD
~ 18,000 lbs total

**Shipboard
Bringback**
~10,000 lbs





CTOL & CV Weapons Carriage Requirements



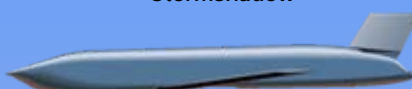
EXTERNAL WEAPONS



426 -Gallon Wing Tank



Stormshadow



AGM-158 JASSM



MXU-648/CNU-88 Baggage Pod



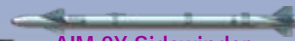
AGM-154A/C JSOW Glide Bomb



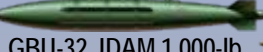
AIM-120B/C AMRAAM



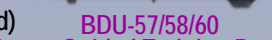
GBU-31 JDAM 2,000-lb
(MK-84 Warhead)



AIM-9X Sidewinder



GBU-32 JDAM 1,000-lb
(MK-83/BLU-110 Warhead)



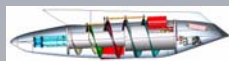
BDU-57/58/60
Laser-Guided Training Round



GBU-31 JDAM 2,000-lb
(BLU-109 Warhead)



Brimstone/Joint
Common Missile



Missionized Gun

MK-76/MK-58/BDU-48

INTERNAL



GBU-32 JDAM 1,000-lb
(MK-83/BLU-110 Warhead)



GBU-12 Paveway II 500-lb LGB
(MK-82 Warhead)



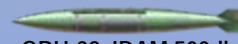
GBU-31 JDAM 2,000-lb
(MK-84 Warhead)



AGM-154A/C JSOW Glide Bomb



CBU-103/105 WCMD



GBU-38 JDAM 500-lb
(MK-82 Warhead)



Brimstone/Joint
Common Missile



GBU-31 JDAM 2,000-lb
(BLU-109 Warhead)



AIM-120C AMRAAM



AIM-132 ASRAAM

Weapons Currently Under Development



UK 500# PGB



Phase I SDB

EXTERNAL WEAPONS



GBU-10 Paveway II 2,000-lb LGB (MK-84 Warhead)



GBU-24A/B Paveway III 2,000-lb LGB (MK-84 / BLU-109 Warhead)



GBU-16 Paveway II 1,000-lb LGB (MK-83 Warhead)



MK-83 BLU-110 LDGP 1,000-lb LDGP



MK-83 BSU-85 HDGP



MK-84 2,000-lb LD/HDGP



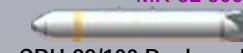
MK-84 BSU-50 Ballute 2,000-lb HDGP



GBU-12 Paveway II 500-lb LGB
(MK-82 Warhead)



MK-82 500-lb LD & HD



CBU-99/100 Rockeye II
Cluster Munition



CBU-103/105 WCMD



AIM-132 ASRAAM

Store Fully Certified During SDD



STOVL Weapons Carriage Requirements



EXTERNAL WEAPONS



426-Gallon Wing Tank



Stormshadow



AGM-158 JASSM



MXU-648/CNU-88 Baggage Pod



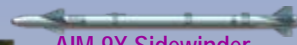
AGM-154A/C JSOW Glide Bomb



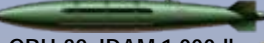
AIM-120B/C AMRAAM



GBU-31 JDAM 2,000-lb
(MK-84 Warhead)



AIM-9X Sidewinder



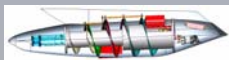
GBU-32 JDAM 1,000-lb
(MK-83/BLU-110 Warhead)



BDU-57/58/60
Laser-Guided Training Round



GBU-31 JDAM 2,000-lb
(BLU-109 Warhead)



Missionized Gun



Brimstone/Joint
Common Missile

MK-76/MK-58/BDU-48

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(MK-83/BLU-110 Warhead)



GBU-12 Paveway II 500-lb LGB
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Common Missile



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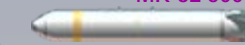
MK-84 BSU-50 Ballute 2,000-lb HDGP



GBU-12 Paveway II 500-lb LGB
(MK-82 Warhead)



MK-82 500-lb LD & HD



CBU-99/100 Rockeye II
Cluster Munition



CBU-103/105 WCMD



AIM-132 ASRAAM

Store Fully Certified During SDD



Weapons Integration Progress

Design Integration



CTOL Gun System Testing



S&RES Testing



SMS Testing



AME Hardware



Flight Clearance





Weapons Installed/Flown on AA-1



Loaded Inert AMRAAM & GBU-31/32



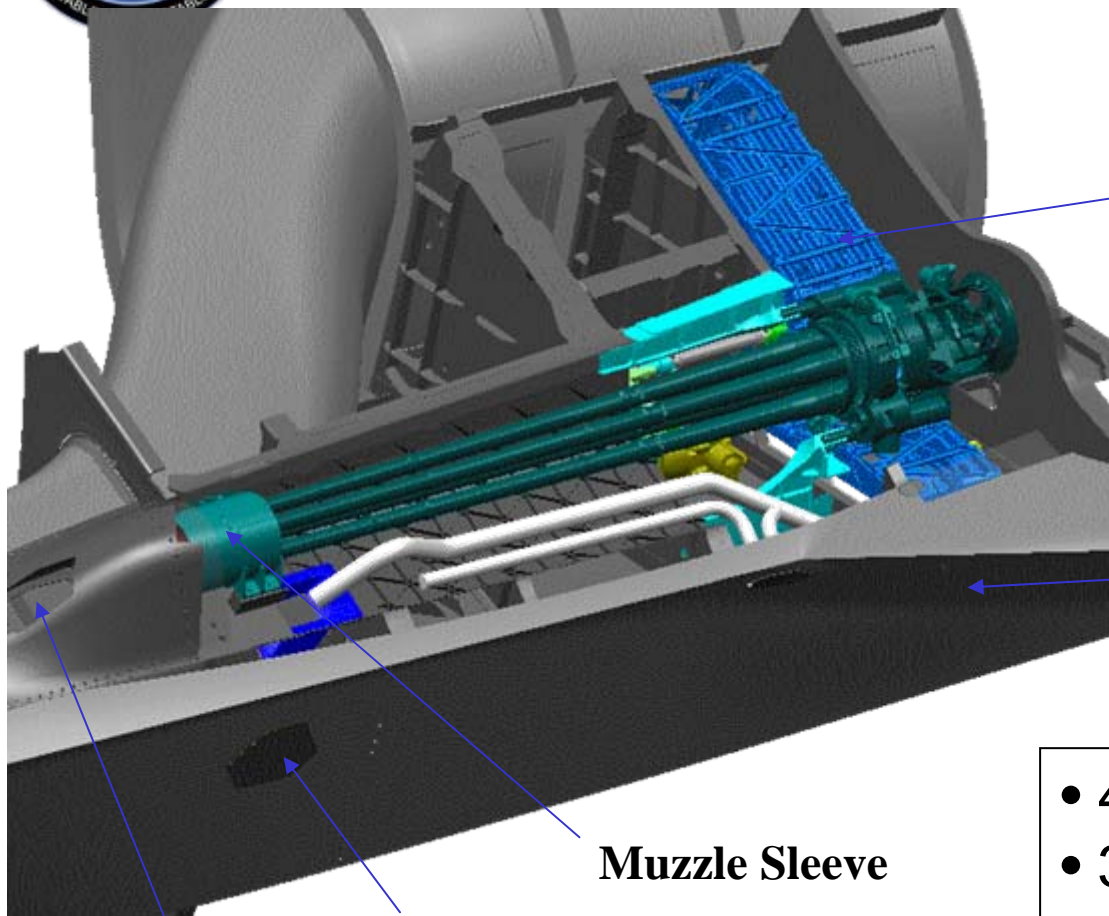
BF-1 Fit Check: 1000lb JDAM, AMRAAM





CTOL Gun System Installation

General Dynamics GAU-22 25mm Gun



Ammunition Container

Reload Access

Muzzle Sleeve

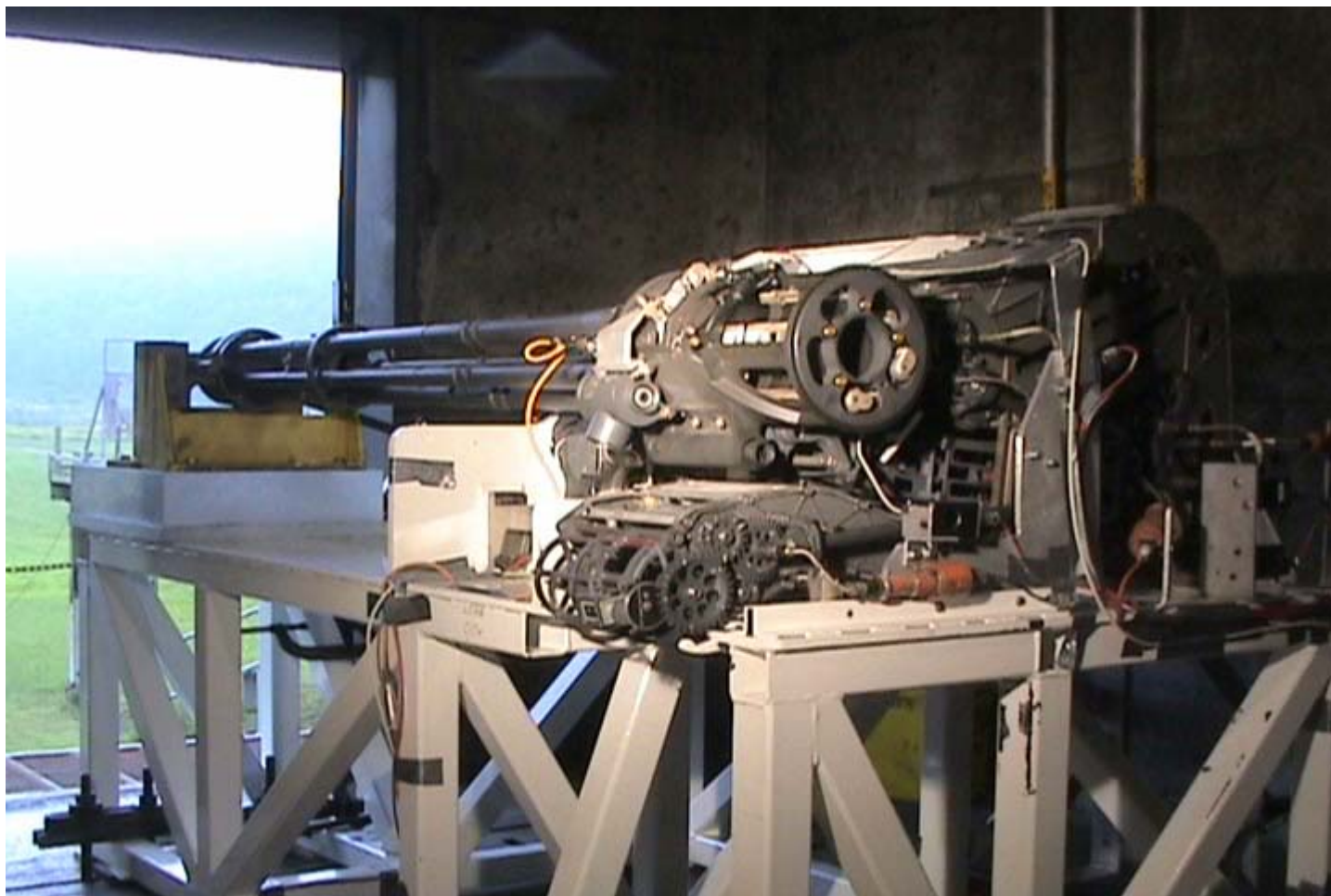
Purge Door

Muzzle Door

- 4 Barrel 25mm Gatling gun
- 3000 SPM firing Rate
- 182 Rounds PGU-20 (DU)
- Hydraulic Drive



GAU-22; 30 Round Burst



Questions?



CAPT John “Snooze” Martins
Director, Air Vehicle
F-35 Lightning II Program Office
John.martins@jsf.mil



JSF Flight Test Video



JSF Program Video

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

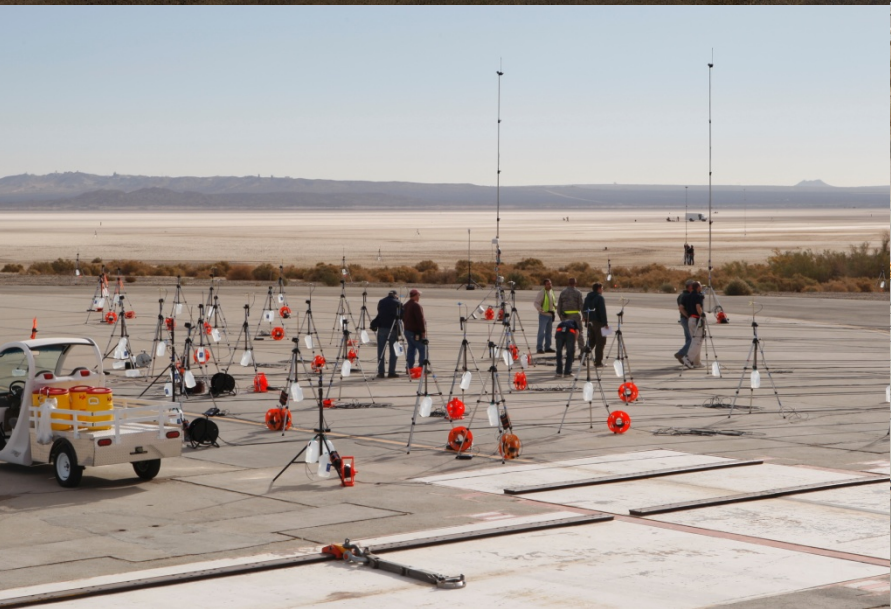






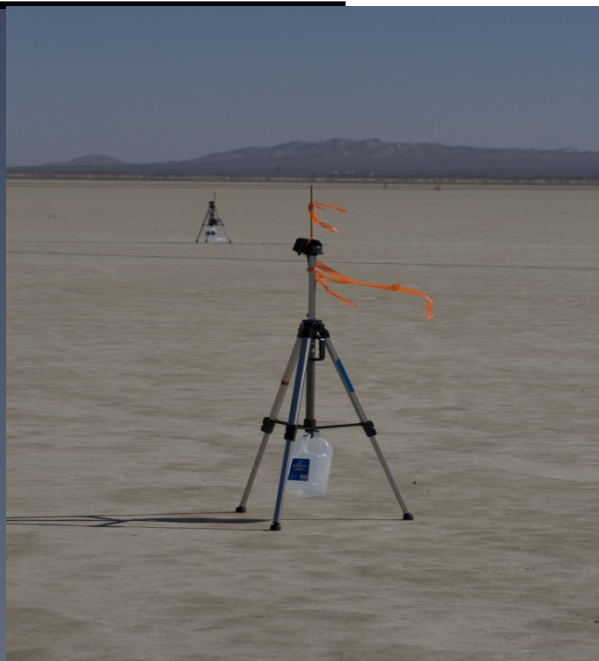


Edwards Noise Testing Ground Run-Up Photos





Edwards Noise Testing Flyover Photos





DISTRIBUTION STATEMENT D: Distribution authorized to the DoD and DoD contractors only. Software documentation date: 30 Jun 03. Other requests for this data should be referred to Precision Fires Rocket and Missile Systems Project Office, SFAE-MSLS-PF-PDT, Redstone Arsenal, AL.
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Precision Fires Rocket and Missile Systems

***Presentation to
Precision Strike Association
Annual Review***

***Fort Walton Beach, FL
11 March 2009***



***Recipients of the 2008
William J. Perry Award***

***COL David J. Rice
Project Manager
Precision Fires Rocket and Missile Systems
Phone (256) 876-1196 (DSN 746)
Email: david.rice@msl.army.mil***

Any Warfighter - Anywhere - All The Time



PFRMS Systems at War



- All systems are supporting the Global War on Terrorism
- Currently supporting Operation Iraqi Freedom and Operation Enduring Freedom
- Performance is above Army Standards
- Launchers returning in excellent condition requiring only routine and minimal maintenance



M270A1
98% Readiness Rate

HIMARS
99% Readiness Rate

GMLRS Unitary
1,124 Rockets Fired
As of 5 Mar 09
98% Reliability

ATACMS
543 Missiles Fired
As of 10 Dec 09
98% Reliability



Any Warfighter, Anywhere, All The Time

UNCLASSIFIED



GMLRS-Unitary Rocket Usage in Theater



1,124 Total Rockets Fired As Of 5 Mar 2009

Who Shoots GMLRS-U:

<i>US Army</i>	<i>648</i>	<i>57.65%</i>
<i>USMC</i>	<i>27</i>	<i>2.4%</i>
<i>UK</i>	<i>449</i>	<i>39.95%</i>

<i>M270A1</i>	<i>51%</i>
<i>M142</i>	<i>12%</i>
<i>M270B1</i>	<i>37%</i>

US Army Missions

Who Requests GMLRS-U:

<i>Army</i>	<i>421</i>	<i>65%</i>
<i>USMC</i>	<i>121</i>	<i>19%</i>
<i>Other</i>	<i>106</i>	<i>16%</i>

How GMLRS-U is employed:

<i>Troops in Contact</i>	<i>183</i>	<i>28%</i>
<i>Pre-Planned</i>	<i>465</i>	<i>72%</i>

Environments employed:

<i>Urban/COIN</i>	<i>619</i>	<i>96%</i>
<i>Other (TD/Test)</i>	<i>29</i>	<i>4%</i>

Operationally Effective: 98.3%

Capability Gap: Persistent, responsive, all-weather, rapidly-deployable, long-range, surface-to-surface, precision-strike capability.

Description

- GPS-Augmented Inertial Guidance
- 200lb-Class HE IM-Compliant Warhead
- Multi-Fuze Selection (Point Detonating, Delay, Proximity)
- 15-70km Range



Current Targets

- Precisely Located/Mensurated Point targets
- Congested/Complex Urban Targets
- Targets in Areas Where Collateral Damage is of Concern

Effectiveness/Reliability

- BDA Shows High Level of Effectiveness
- Rare Reports of Minor Collateral Damage
- Reliability of US Army Missions: 98.68%

Any Warfighter, Anywhere, All The Time

UNCLASSIFIED



ATACMS QRU Usage In Theater



543 Total Missiles Fired as of 10 Dec 2008

OIF/OEF MISSIONS

Who uses ATACMS?

Army	145	28%
Marines	77	15%
USAF	290	57%

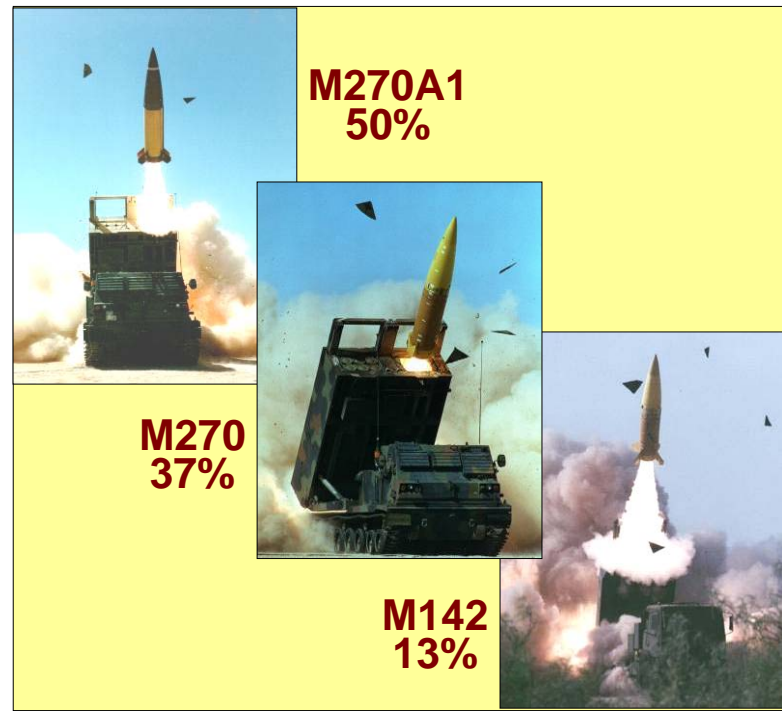
How ATACMS is Employed:

Time-Sensitive Targets	205	40%
Pre-Planned	307	60%

Employment Environments:

Initial OIF Conflict	460	90%
COIN	52*	10%

*QRU & T2K Unitary



Mission Process

- Target located by Multiple Sensors
- Target refined using Precision Strike Suite - Special Operation Forces or Mensuration via Rainstorm / Raindrop, etc.
- Passed to AFATDS for tactical fire control
- Launcher receives and executes mission



Launcher Theater Accomplishments



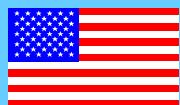
- All FAL variants (M270, M270A1, M270B1 and M142) have supported GWOT operations
- Launchers variants currently support both OIF and OEF operations
 - 13 Army M142s support OIF / OEF
 - 4 UK M270B1s support OEF
 - 16 Army M270A1s support OIF
 - 6 USMC M142s support OIF
- Launchers deployed in Theatre continue to perform above Army Standards
 - Operational readiness exceeds 97%
 - Reliability is over 350 hours between System Abort Failures
 - No maintenance issues
- M142 and M270A1 launchers returning from both Theaters are in excellent condition requiring minimal Reset





MLRS Worldwide Third Party Sales

MOU PARTNERS



US



UK



FRANCE



GERMANY



ITALY



Canada**
{17}



SLOVAKIA
[26] 1/



FINLAND
(22)



NORWAY
(12)



DENMARK
(12)



JORDAN**
{18}



SOUTH KOREA
(48) [10] (A-220)



JAPAN
(77) + [22] *



SINGAPORE
{18}



UAE
{20} (A-101)



OMAN**
{20}



BAHRAIN
(9) + [6]
(A-30)



ISRAEL
(48)



EGYPT
(26)



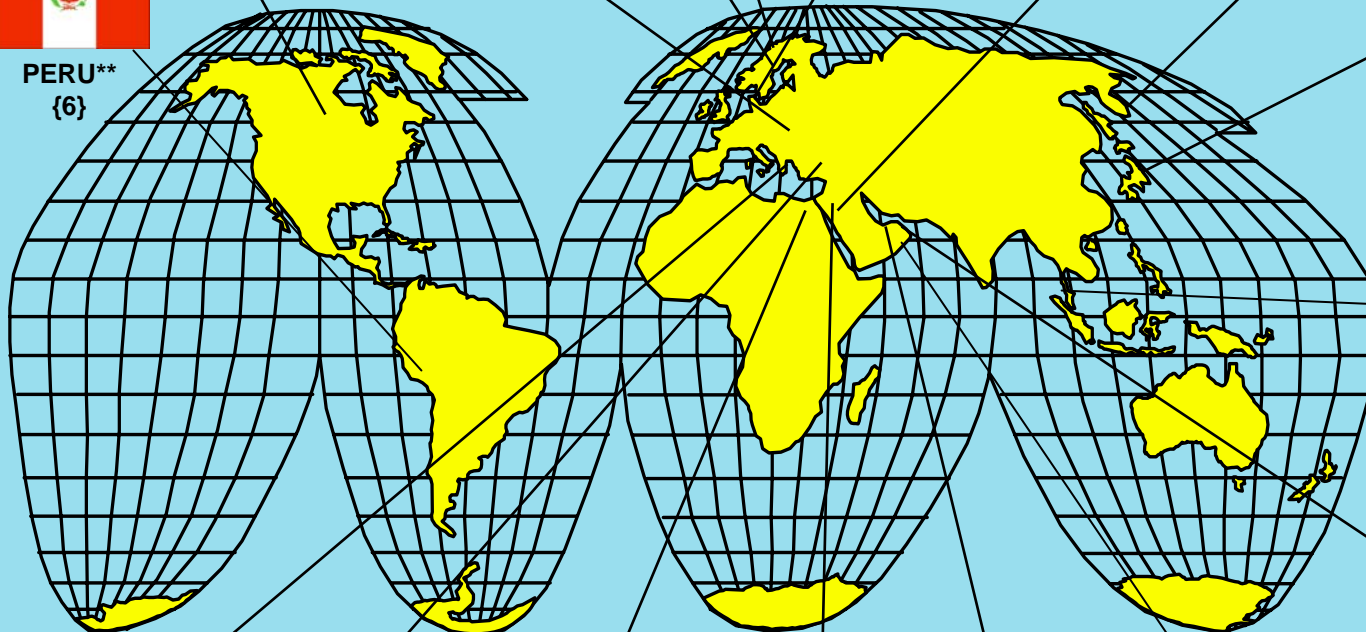
TURKEY
(12) (A-71)



GREECE
(36) (A-100)



PERU**
{6}



(A) ATACMS
{ } HIMARS
() M270
[] M270A1
* Co-Production

** Potential



The Future for Cluster Munitions

Requirement: Suppress, neutralize, destroy various armored or soft, mobile or fixed, active or passive, precisely or imprecisely located, high-payoff area and point targets

Cluster Munitions Policy Memo (19 Jun 08)

- After 2018, cluster munitions must not produce >1% UXO; limit will not be waived
- No differentiation between types of UXO (hazardous or non-hazardous duds)
- All cluster munition stocks that exceed operational planning requirements will be removed from the inventory as soon as possible, but not later than Jun '09

Self Destruct Fuze (SDF) Development and Performance

- Previous UXO Requirement: <2% 20-60km; <4% <20km and >60km
Does not Comply with the new DOD Policy
- GMLRS DPICM w/pSDF demonstrated "hazardous" dud rate of only 0.15%, overall UXO 3.7%:
Does not comply with the new DOD Policy

In 2019, the Army will no longer have the ability to efficiently engage inaccurately located and area targets!

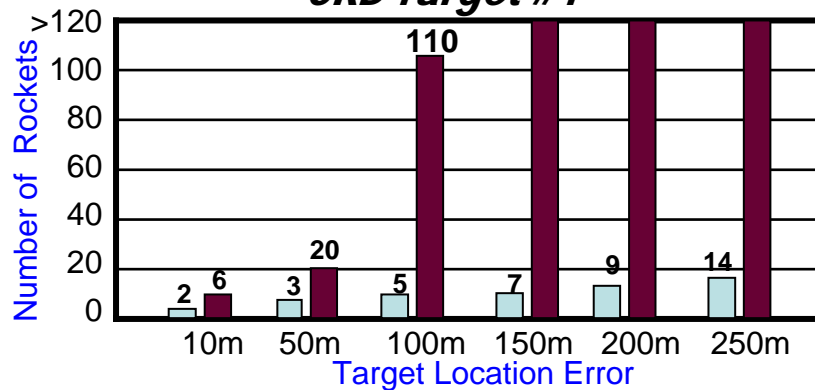


GMLRS DPICM ORD Target Engagements

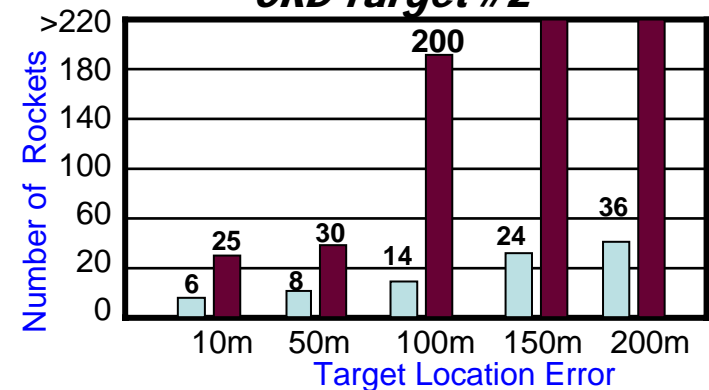


- GMLRS DPICM in Full Rate Production, yet no longer deemed politically suitable
- Unacceptable rate of unexploded ordnance
- Long range radar accuracy is not adequate for efficient GMLRS unitary target engagements beyond cannon artillery ranges

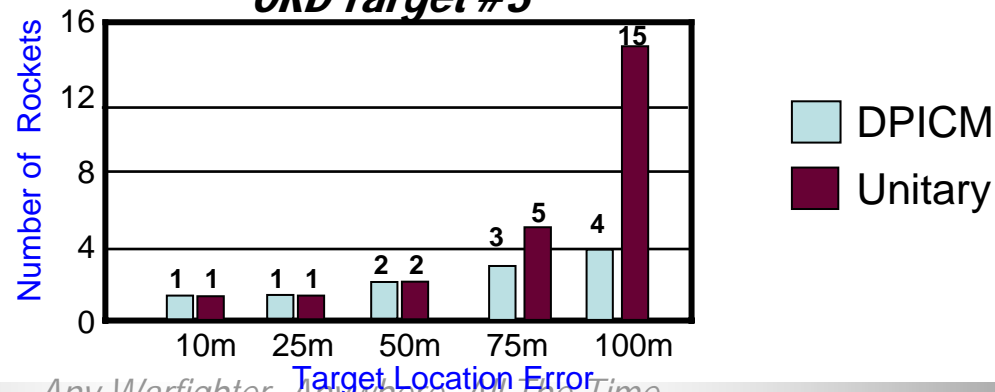
ORD Target #1



ORD Target #2



ORD Target #3





Inventory and Operational Risks



Serviceable Rocket Inventory 2008-2019

2008			2019
Munition	Available munitions	Range	Available munitions
M26 (DPICM)	360,192	32.5km	0
M26A2 (DPICM)	3,924	45.0km	0
M30 (DPICM)	1,914	70.0km	0
M31A1 (Unitary)	204	70.0km	33,006

ZERO

Operational Risks

- GMLRS AWP production schedule may not provide sufficient numbers by 2019 to support COCOM operational plans
- AMSAA/ARL approved models for AWP technologies



Program Overview



- Program composition
 - ACAT 1C with two variants
 - DPICM in Full Rate Production (FRP)
 - Unitary Completing LRIP headed to FRP Decision
 - Variants share documentation
 - APB
 - Common Funding (RDTE and Procurement) Lines
-

Second Order Effects

- Impact to APB
- Item C of Nunn-McCurdy ADM (April 2007)
- Future of DPICM Production
- Elimination of DPICM, impact on the USMC and FMS Customers



AWP Performance Parameters



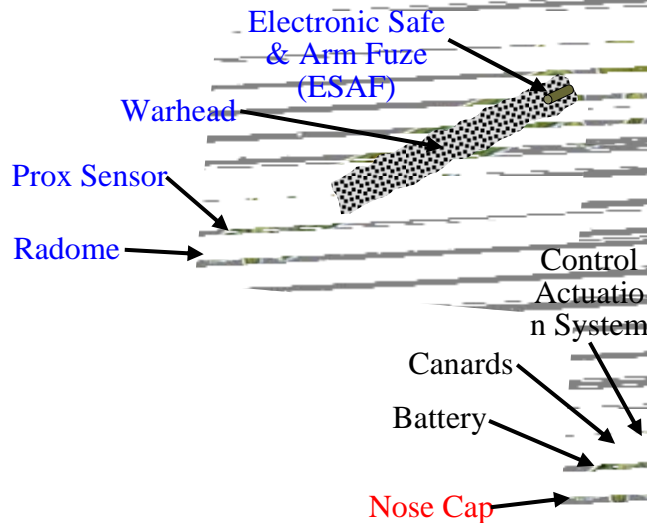
- Meets DPICM ORD requirements in servicing targets
- Produce no residual cluster munition UXO
- Achieve required warhead IM rating
- Compatible with the M270A1 and HIMARS Launchers



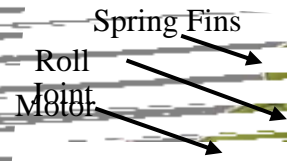
GMLRS System Description



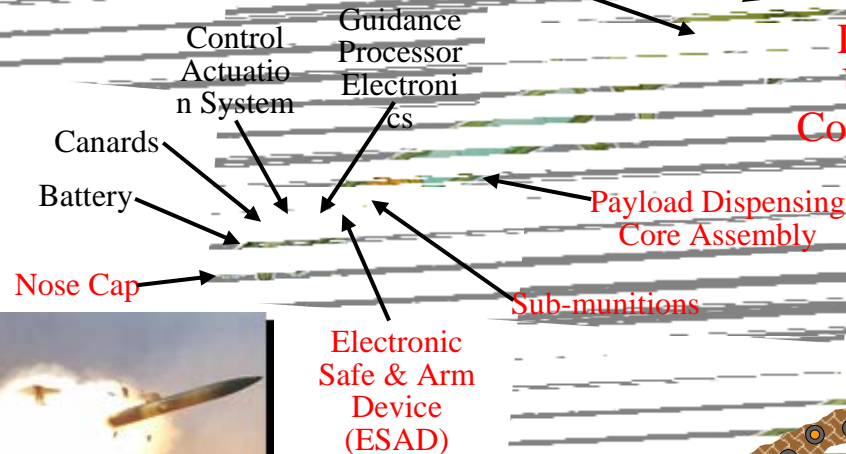
Unitary Unique Components



GMLRS Common Components



DPICM Unique Components



Alternative Warhead Unique Components



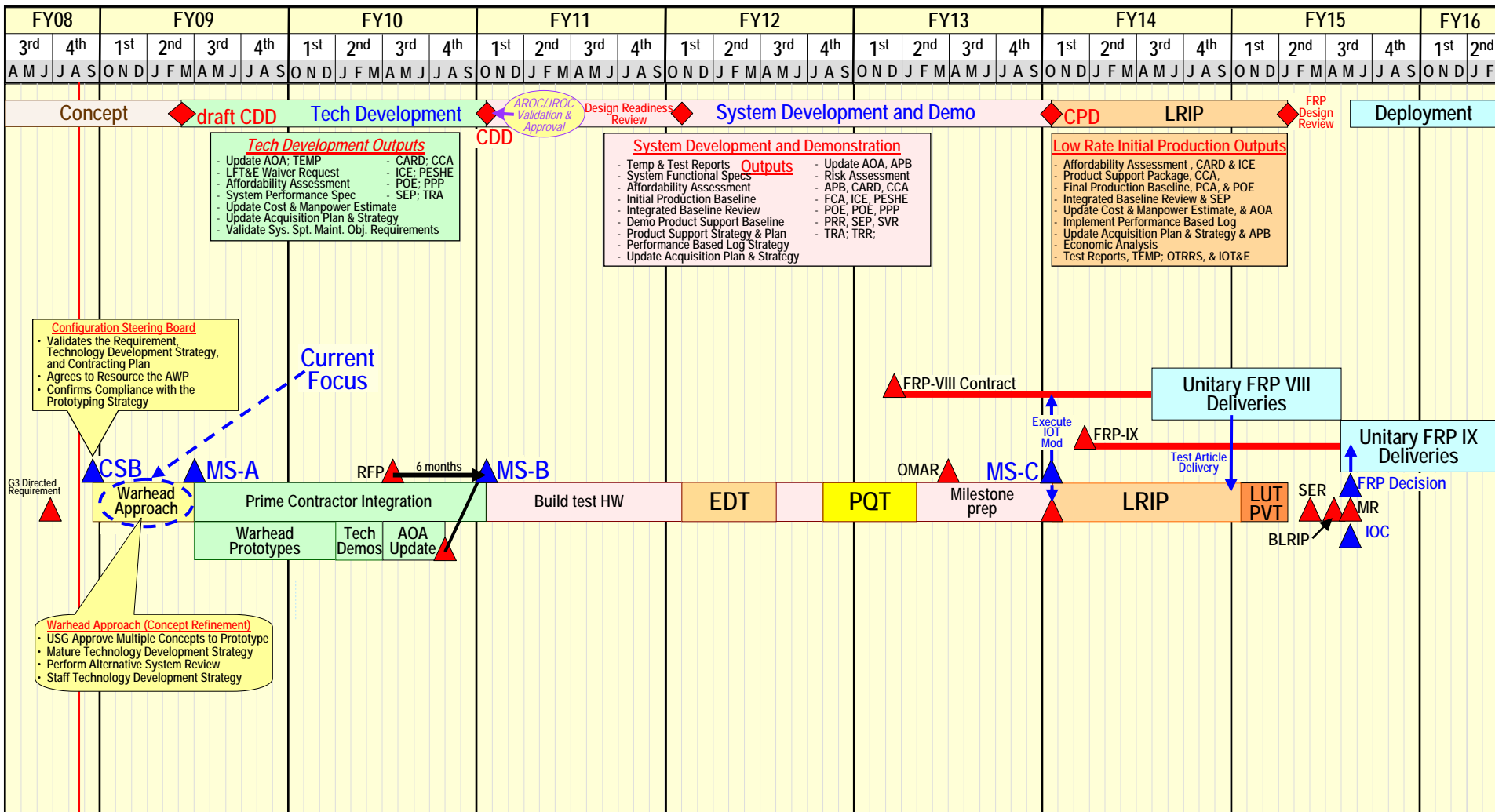
HIMARS



M270A1

Any Warfighter, Anywhere, All The Time

UNCLASSIFIED





Review of Eliminating DPICM



- Current pSDF (nor DPICM) is not compliant with DoD cluster munition policy
- Must demilitarize all non-compliant DPICMs after 2018; cost TBD
- UAE DPICM Procurement in FRP 4
- USMC Unexercised DPICM Option in FRP 4

Recommend Build Unitary in Lieu of DPICM FY09-FY13



Questions?



Strike – from an OSD Perspective

Keith Sanders

Precision Strike Annual Review 2009

March 10, 2009



Outline

- Department's Precision Engagement Vector
 - Guidance from the Secretary of Defense
 - Operational emphasis and CONOPS
 - What does it all mean?
- Business Practice Changes
 - Acquisition policies
 - Cost and schedule control
 - Program governance and Legislative initiatives
- Implications



The Department's Strike Vector

SecDef's Perspectives & Priorities

“When we are at war, I believe the overriding priority of the Defense Department and military services should be to do everything possible to provide troops in the field everything they need to be successful.”

“The question I keep coming back to is, why did I have to go outside the regular Pentagon bureaucracy in order to build MRAPs and to get additional ISR?”

“The problem is there are two different mentalities involved. The one is the typical culture in the Defense Department, which is 99-percent, exquisite solutions over a five- or six- or 10-year period, and the other is a 75-percent solution in weeks or months. And people approach problem-solving in very different ways when they have that different kind of experience. We've got to figure out how to be able to walk and chew gum at the same time.”



The Department's Strike Vector

SecDef's Perspectives & Priorities (cont'd)

“Chief among institutional challenges facing the Department is acquisitions.”

The current situation is “one of those rare chances ... to critically and ruthlessly separate appetites from real requirements, those things that are desirable in a perfect world from those things that are truly needed in light of the threats America faces and the missions we are likely to undertake in the years”

“Our procurement and preparation for conventional scenarios must, in turn, be driven more by the actual capabilities of potential adversaries, and less by what is technologically feasible given unlimited time and resources.”

“I will pursue greater quantities of systems that represent the ‘75 percent’ solution instead of smaller quantities of ‘99 percent’ exquisite systems.”



The Department's Strike Vector

SecDef's Perspectives & Priorities (cont'd)

“I feel that many programs that cost more than anticipated are built on an inadequate initial foundation. I believe the department should seek increased competition, use of prototypes – including competitive prototyping – and ensure technology maturity so that our programs are ready for the next phases of development.”

“We must freeze requirements on programs at contract award and write contracts that incentivize proper behavior.”



The Department's Strike Vector

Operational Emphasis

- Increased emphasis on ISR
 - New sensors
 - MP-RTIP
 - LSRS
 - ESM
- Increased emphasis on Irregular Warfare
 - Armed UAVs
 - Hostile Fire Indication – and responses
 - New, more versatile gunship
- Increased emphasis on persistence
 - Reaper / Sky Warrior
 - C-12s



The Department's Strike Vector

ISR and Intel Focused CONOPS

- Signals intercepts via high demand, low density platforms
- Airborne ISR to establish long term tracks
- Targeting at remote site(s)
- Authority to engage established during lengthy track periods
- Engage from
 - onboard sensor aircraft
 - third party shooter with targeting data transferred from CAOC or Forward Air Controller



The Department's Strike Vector

ISR and Intel Focused CONOPS (Cont'd)

- Prior rush to establish broad net-centric warfare capabilities has been refocused toward penetrating aircraft
- Deliberate, Selective, Time-of-our-choosing CONOPS are the order of the day
 - Time sensitive engagements but with all the 'a priori' checks and approvals
 - Little delegation of responsibilities
 - Lots more watching; Lots fewer lethal engagements



Business Practice Changes

- Acquisition Policy
 - New DoDD 5000.02
 - Mature designs prior to Milestone B
 - Competitive Prototyping
 - Business Case Certifications prior to Milestones A & B
 - Peer Reviews for major source selections
- Cost and schedule control
 - Renewed emphasis on Fixed Price Type contracts
 - Configuration Steering Boards to scrub requirements
 - Invigorated emphasis on Earned Value Management



Business Practice Changes (Continued)

- Program governance
 - Increased emphasis on technical maturity within a program phase
 - Minimal risk in proceeding to next phase
 - Frequent 'In Process Reviews'
 - At least annually with Milestone Decision Authority (MDA)
 - Additional event-based reviews
 - Independent assessments to advise MDA
 - Third-party teams for Operational Test Readiness Reviews
 - Joint Analysis Teams, Defense Support Teams & Ad hoc specialty teams



Business Practice Changes (Continued)

- Legislative initiatives
 - SASC: Weapon System Acquisition Reform Act of 2009 (S.454)
 - To address unreasonable cost and schedule estimates, performance expectations, immature technologies and repeated program changes that have led to explosive cost growth and costly schedule delays
 - HASC: The Panel on Defense Acquisition Reform
 - To address fundamental issues that lie behind the Pentagon's continuing problems in acquiring goods and services on time and on budget
 - Targeting NDAA of FY10 / FY11



Implications to Precision Strike

- Fewer New Starts of major programs
- Renewed interest in upgrade/modification efforts
 - Expand number and variety of sensor platforms
 - Expand capture and analysis of existing sensor data
- Renewed interest in growing system reliability, system persistence and endurance
- Possible interest in better matching sensors, comms and weapons to 'needs' of ISR platforms
 - Small size, weight, power
 - “Agile” with short engagement times
 - Low collateral damage



Implications to Precision Strike (Continued)

- For the few major acquisition programs
 - Competitive prototyping
 - Down-selects based on test results, EVM performance and management proficiency
 - Go slow in the early program phases
 - Design maturity before Milestone B
 - Go fast through formal Test & Evaluation and initial production
 - Expect lots of outside scrutiny, schedule risk analyses, second-guessing by well-informed third parties
 - Expect careful decision-making by MDA



JDAM / Laser JDAM





Questions?

Comments?

Rebuttals?



Air Armament Center



Flexibility Precision Weapons Bring to the Fight



Dr Bruce Simpson, SES
Director 308 ARSW
11 Mar 2009



308 ARSW Mission/Vision

Mission Statement

Equip Our Warfighters with Air Dominance, Strike, and Combat Support Capabilities to Fight and Win Decisively



Vision Statement

War Winning Capabilities...On Time, On Cost





Capabilities Evolving and Integrating into the Battlespace



Networked Weapons and Platforms

Capabilities

- Precision
- Moving targets
- Low collateral damage

Integration Capabilities

- Find/fix/target
- Decoy
- Suppress/deny

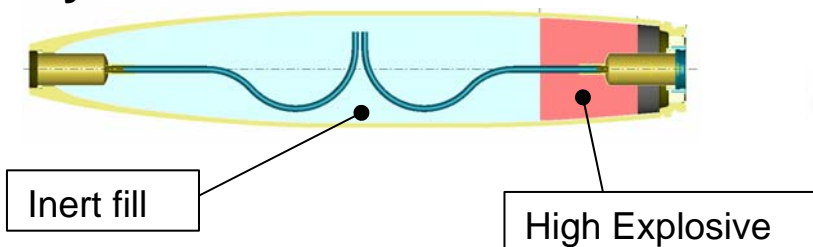


Joint Direct Attack Munition (JDAM)

- Low cost, guidance *tail kits*
- GPS, Inertial Navigation System
- Mk 80 Series/BLU-109 compatibility
- Accurate <5 meters, in-flight retargeting
- Autonomous & adverse weather capability
- F-15E, F-16, F/A-18, F-22A, AV-8B, B-1B, B-2 B-52H



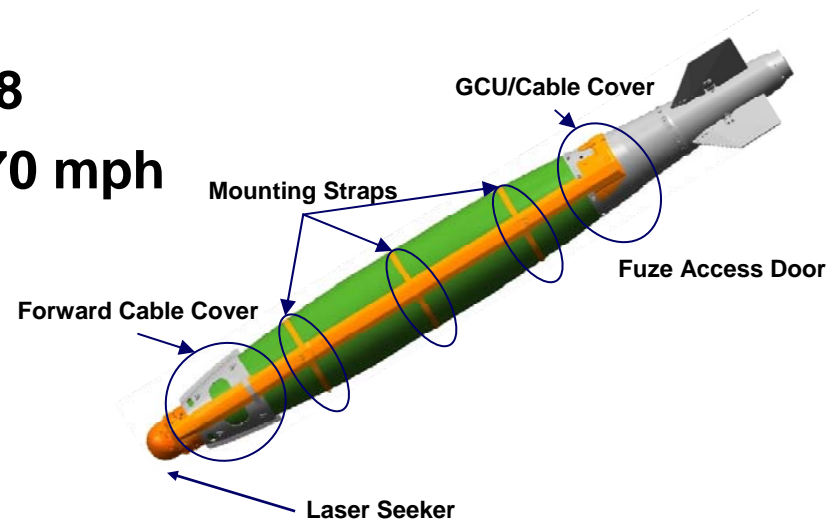
Navy BLU-126 - Low Collateral Damage





Laser JDAM

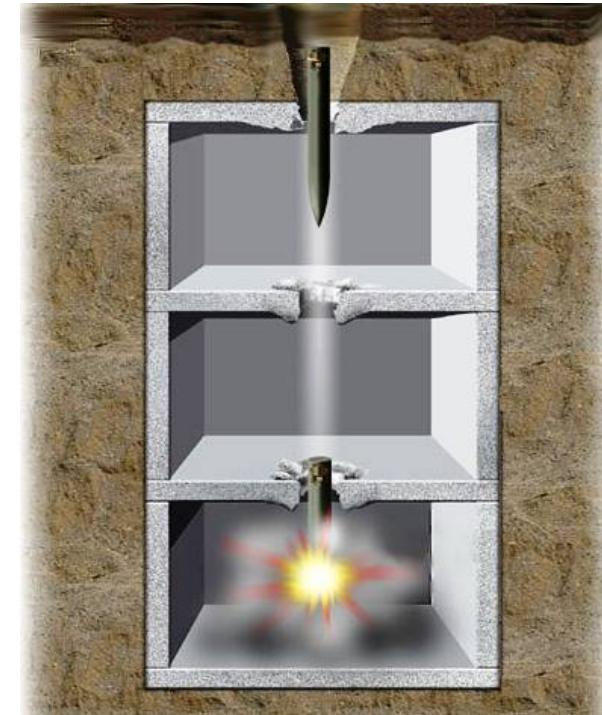
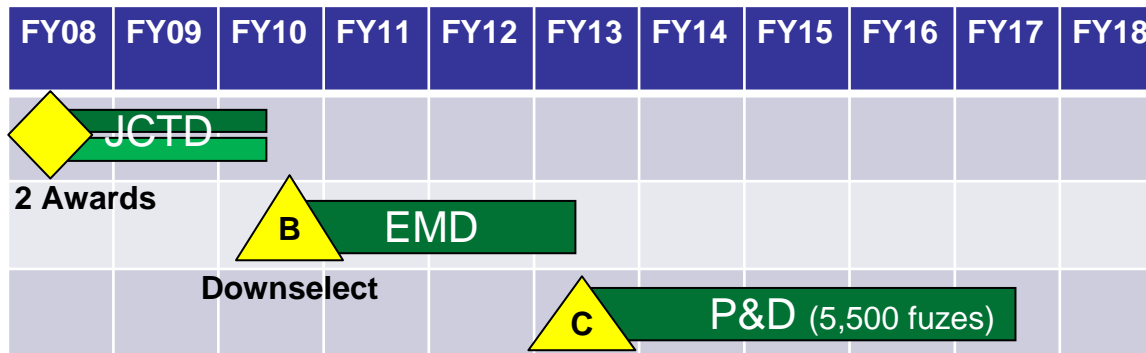
- Response to Urgent Operational Need
- Precision Laser Guidance Kit on GBU-38
- Ability to engage moving targets up to 70 mph
- Accuracy: 3m Stationary, 6m at 70 mph
- Field installable
- Mk-82, BLU-111, BLU-126 compatibility
- F-15E, F-16 Block 40/50, F/A-18A+/C/D
- Production: 400 Air Force, 400 Navy





Hard Target Void Sensing Fuze

- Capable of defeating hardened and deeply buried targets
- Capable of sensing multiple voids
- Capable of operating in hardened concrete
- Reprogrammable from aircraft cockpit





Small Diameter Bomb (SDB I)

- All-weather, autonomous, precision
- 250 lb class GPS/INS weapon
- Reduced collateral damage
- Flexible attacks with standoff ranges >50nm
- Increased loadout--multiple strikes per sortie
- Cockpit-selectable electronic fuze
- F-15E can receive or self generate coordinates



BRU-61



SDB Focused Lethality Munition (FLM)

- FY06 Out-of-Cycle JCTD
- CENTAF urgent need
- Low collateral damage variant of SDB
- Precisely delivers lethal blast
- Soft targets at risk w/ reduced collateral damage

SDB I Hardware Attaches
to FLM Composite Case



New Technology

- Composite Case Warhead
- Multi-Phase Blast Explosive
- Blast Only



Directed Energy

- Speed of light weapon
- Scalable effects
- Reduced collateral damage



Advanced Tactical Laser

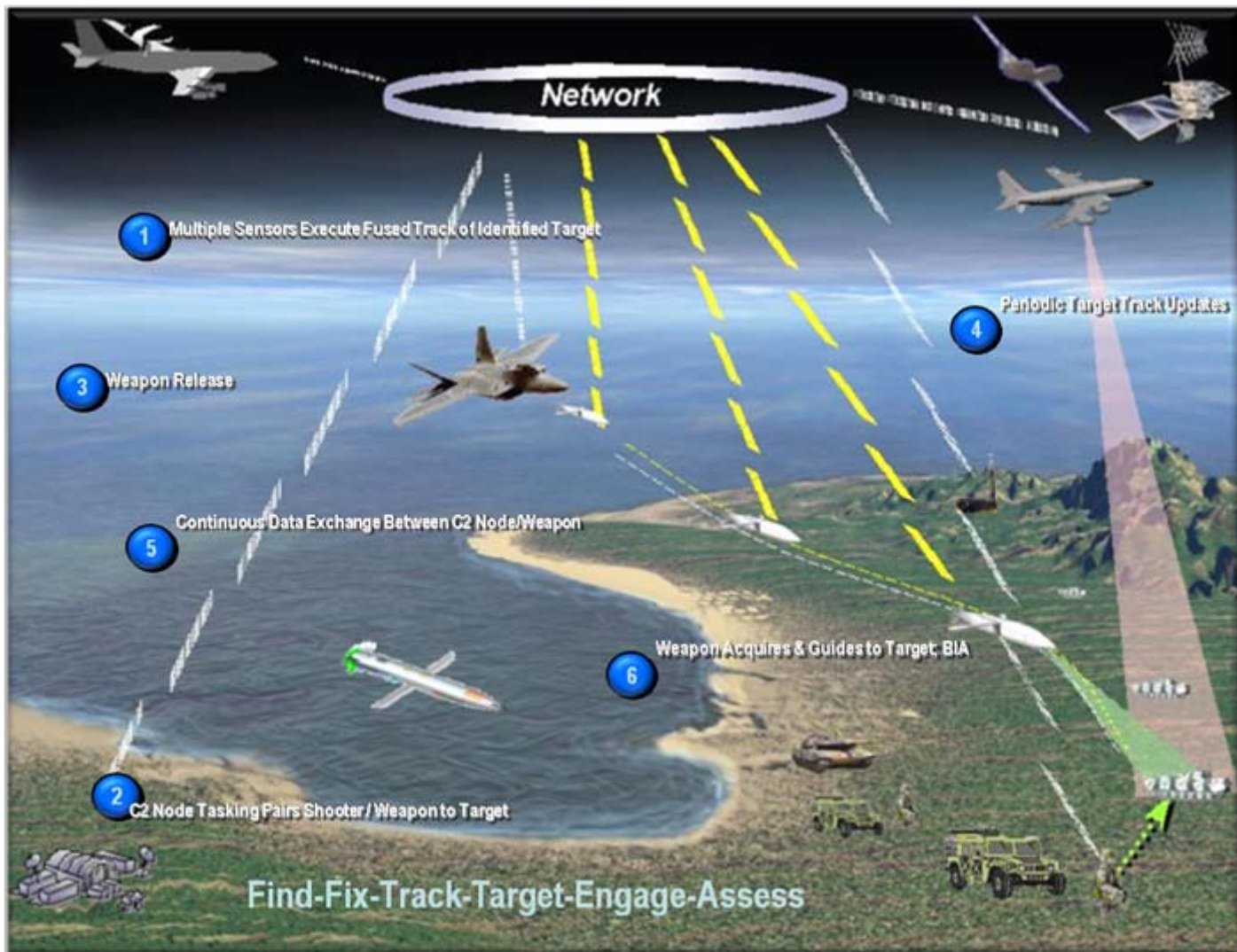


Active Denial System





Integration Capabilities



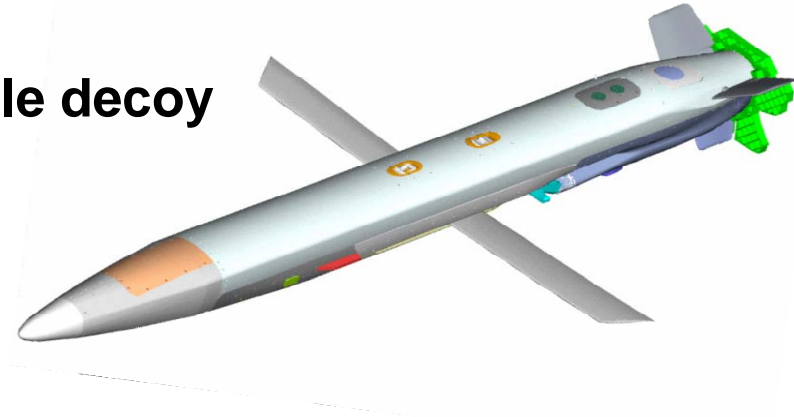


UNCLASSIFIED

Miniature Air Launched Decoy (MALD) MALD Jammer (MALD-J)

MALD








- Small, low-cost, air-launched, expendable decoy
- Stimulates integrated air defenses
- Emulates fighter/attack/bomber
- Increases enemy's "Fog of War"



MALD-J

- Adds jammer and retains decoy capability
- Degrades EW/GCI/ACQ radar tracks



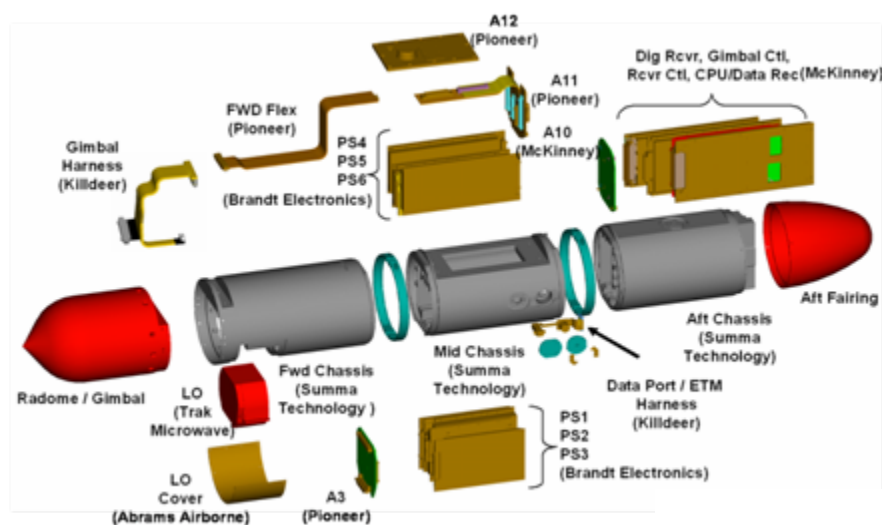
	FY08	FY09	FY10	FY11	FY12	FY13	FY14
MALD							
MALD-J							
							
							

UNCLASSIFIED



HARM Targeting System (HTS)

- Single Ship HARM Targeting
- Multi-ship PGM Targeting
- Time Critical Targeting
 - Targeting mobile SAMs
 - Protecting strike packages
- Increased Detection Range



Network Enabled Weapons



WDLN ACTD

JSuW JCTD

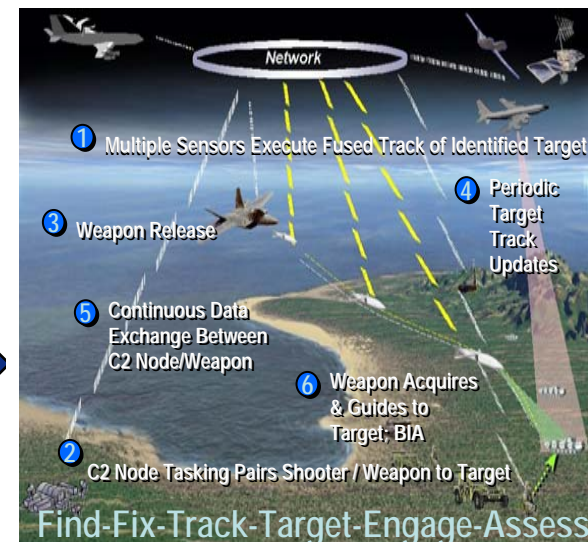
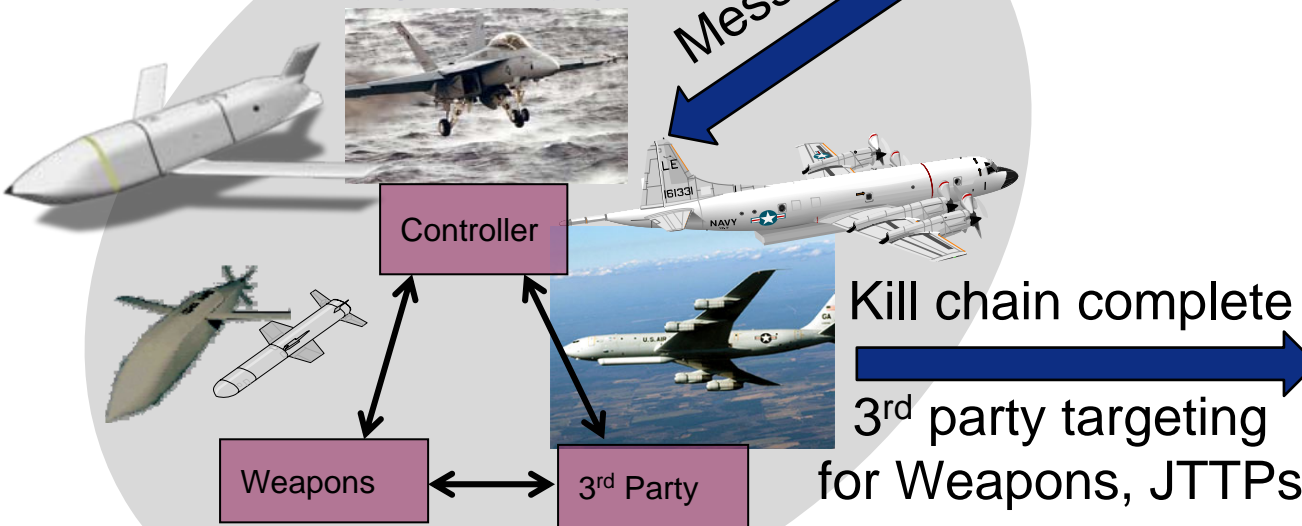
Common Network
Interface/Messages

Messages, basic CONOP



**NEWIWG
Enterprise**

Promoting
Interoperability
among
Weapons
and networked
systems

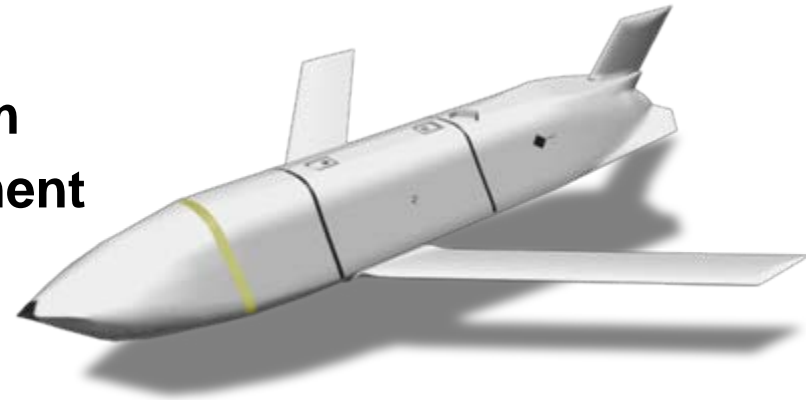


Goal: Any Targeting Asset, Any Weapon



Joint Air to Surface Stand-off Missile (JASSM)

- **Stealthy cruise missile**
- **Precision guided vs. high value targets**
- **Autonomous Launch and Leave >200nm**
- **Survivable in advanced threat environment**
- **Guidance: Inertial Navigation / GPS**
- **F-16C/D, B-1B, B-2A, B-52H**





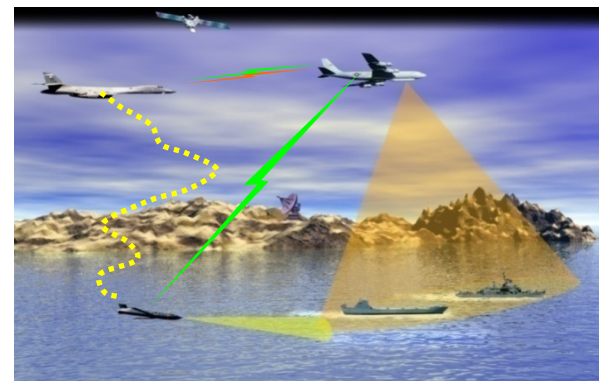
JASSM Extended Range (JASSM ER) JASSM Anti-Surface Warfare (JASSM ASuW)



AGM-158B

ASSM ER

- extends range to > 500 nm



ASSM ASuW

- ability to engage moving ships

Communicates with JSTARS

FY09	FY10	FY11	FY12	FY13	FY14
------	------	------	------	------	------

EMD					
-----	--	--	--	--	--

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tracking

up from the selected missile

JASSM ASuW Schedule

FY10	FY11	FY12	FY13	FY14	FY15
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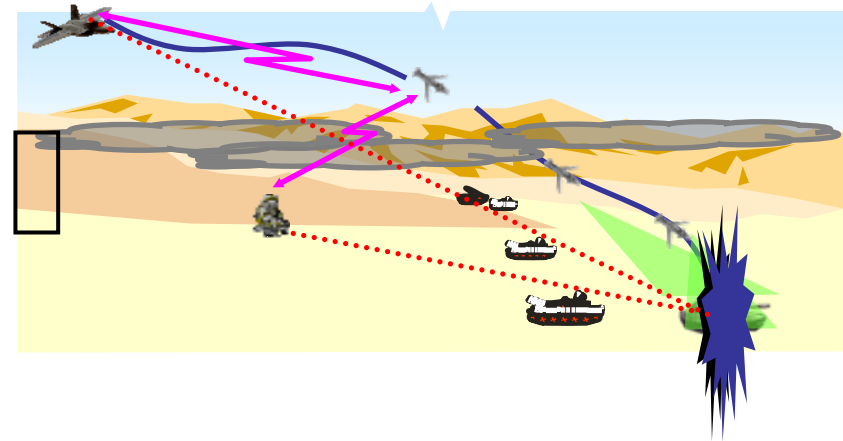
Detailed Sched in Development

IOC

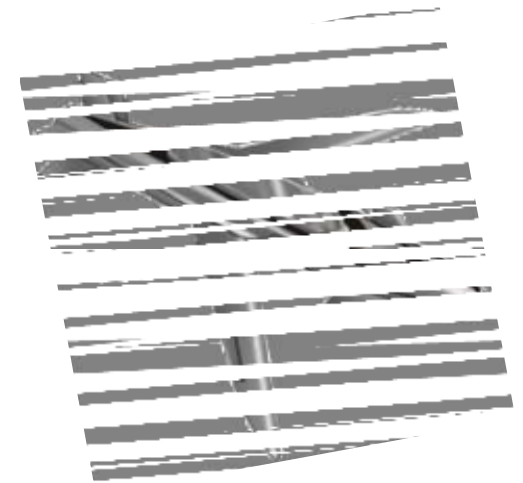


Small Diameter Bomb II (SDB II)

- Capable against moving targets
- Compact, all weather, standoff weapon
- INS/GPS guided, precision weapon
- Multi-mode seeker



FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
TD										
2 Awards										
	B	EMD								
	Downselect				C	P&D (17,000 munitions)				





War-winning Capabilities ...

... On Time, On Cost



A blue globe with binary code (0s and 1s) and text overlays. The text includes "AEROSPACE", "ELECTRONICS", "INFORMATION", "SHIPBUILDING", "TECHNICAL", and "SERVICES".

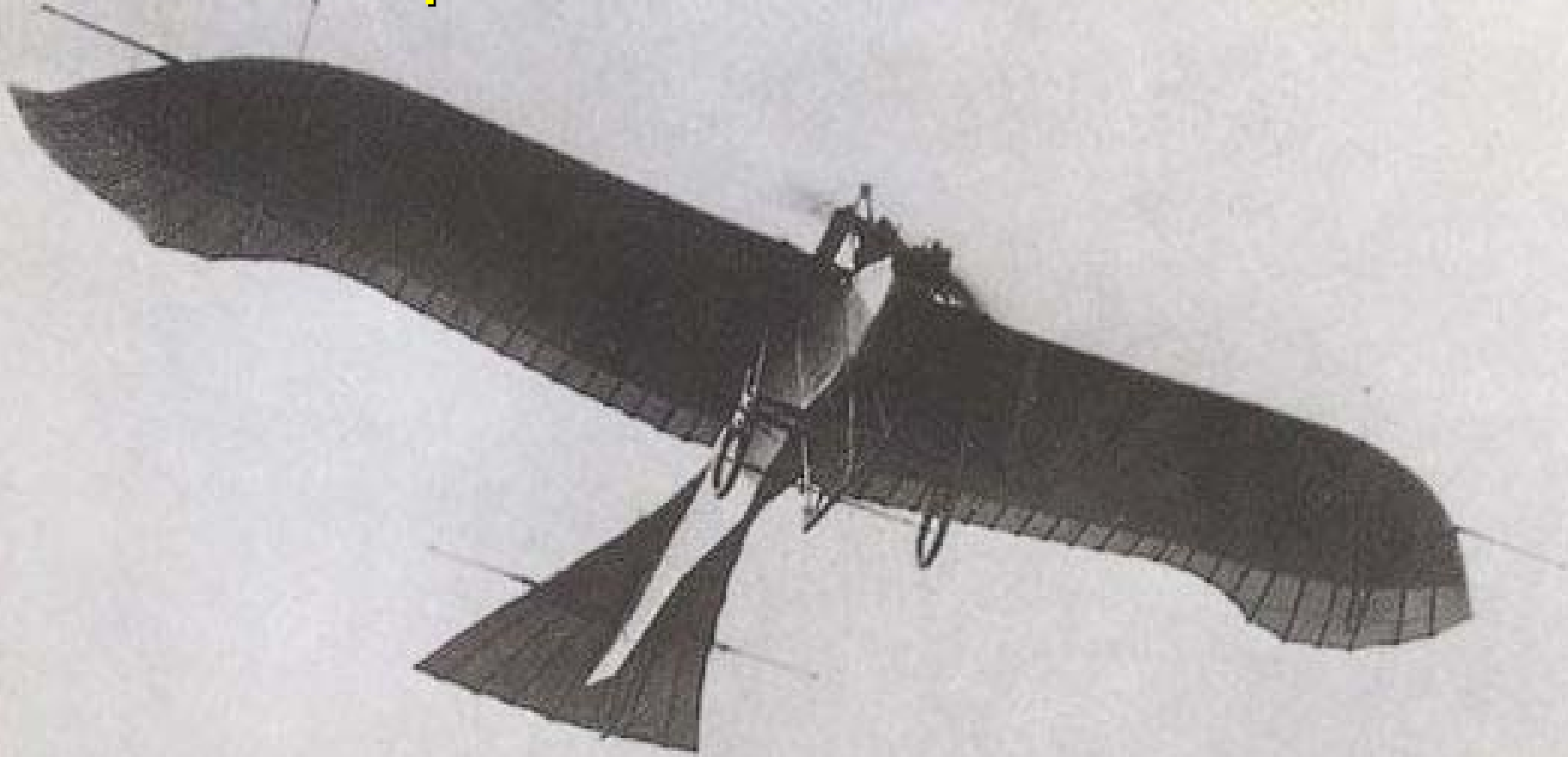
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New Administration & Technologies

Industry's Perspective on
Changes for Precision Strike
March 2009

Doug Young
Vice President, Business Development, Strike and
Surveillance Division
Northrop Grumman Corporation

The future of precision strike ...



... was found a century ago.

The Obama Administration

- Declared Defense Policy Objectives

- End War in Iraq
 - Increase commitment in Afghanistan
- Place “people first”
 - Increase size of Army / USMC
 - Take care of Service Men / Women & Families
 - Note: already occurring with the Economic Stimulus to include health care, child care services, barracks repair / construction, etc
- Restore global partnerships and build a Civilian Assistance Corps to promote stability
- Focus on adapting and building US military capabilities for current needs and missions of the future

...a more efficient and adaptive military well suited to irregular challenges that preserves nuclear deterrence and sufficient conventional warfighting capabilities
– Administration transition team

Hybrid Warfare

Conventional
Warfare

Irregular
Warfare

- Hybrid Warfare – the convergence of disparate types of conflict**
- Civilian-warrior – disciplined, coordinated, autonomous and determined
 - Weapons – AK-47 to cruise missiles and cyber technology
 - Tactics – simple to complex, coordinated with high Situational Awareness
 - Environment – congested urban settings to isolated, inhabitable terrain
 - Nation-states to non-state actors will embrace and exploit

Military Capabilities Needed Today

- ISR – to discriminate, detect and track hostile personnel, operations and capabilities
 - Imbedded in complex, congested urban terrain
 - Scattered in austere mountains to dense jungles
- Strike – to damage or destroy
 - With precise, low collateral damage
 - Lethal and non-lethal effects
 - Against a discrete target
 - Against a deeply buried target
 - Must be survivable and persistent



Previous Targeting Photo



Targeting Challenge Today

Challenge of Precision Strike demands extremely
high fidelity information

Layering ISR

- Maximizing Awareness of the Battlespace

Requirements	Who	What	Where	When	Why
SIGINT	X	X	X	Now & Future	X
IMINT		X	X	Now	
MASINT		X	X	Now	
MTI		X	X	Now	
HUMINT	X	X	X	Now & Future	X

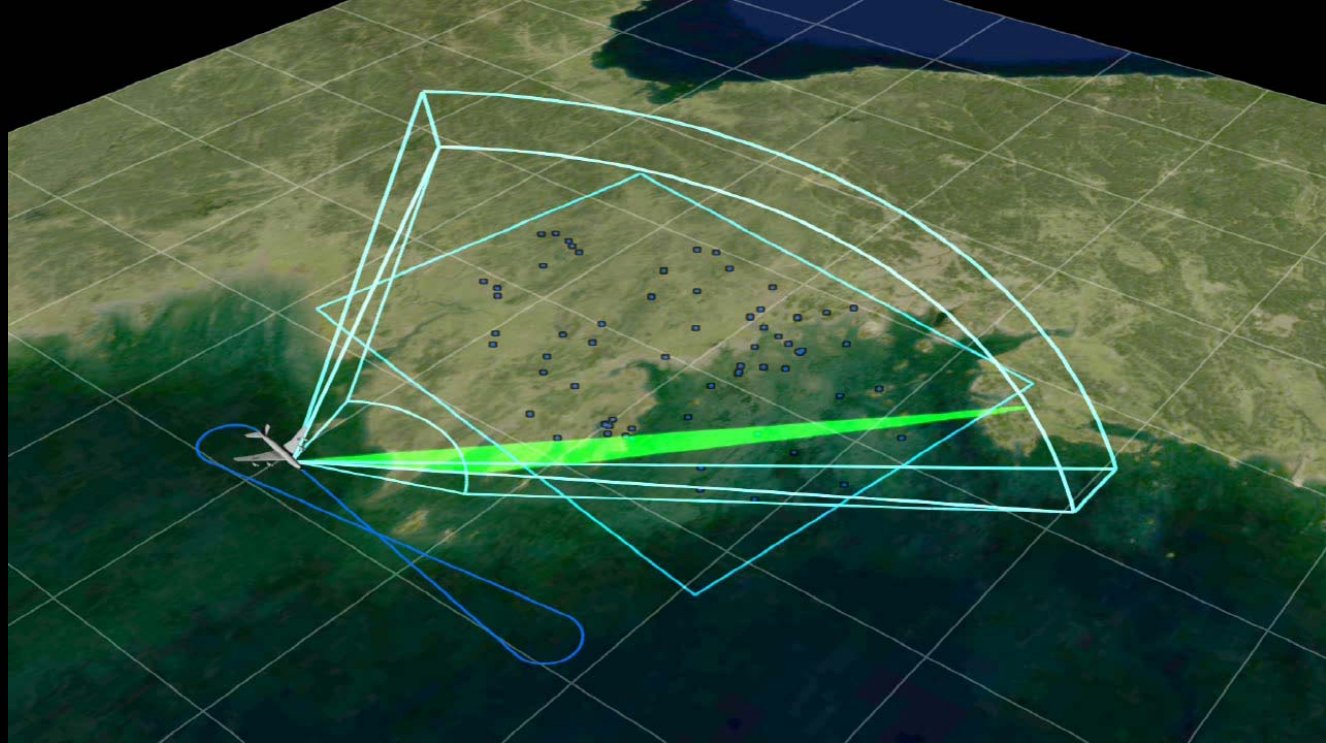
Layering ISR assets provides precise data:

- Where (geo-location)
- When (timing)
- Accuracy (speed, signal type, characterization, picture, etc.)

Improving Persistent Awareness

- Enhancing Fidelity of Ground Surveillance

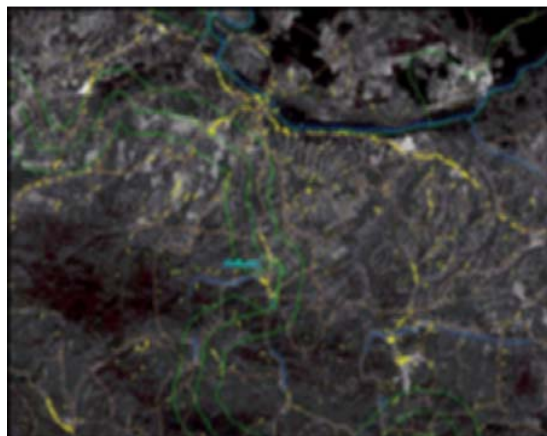
- Current E-8C provides good surveillance and tracking of ground maneuver forces
- Flown over 50,000 hours supporting operations in Iraq and Afghanistan



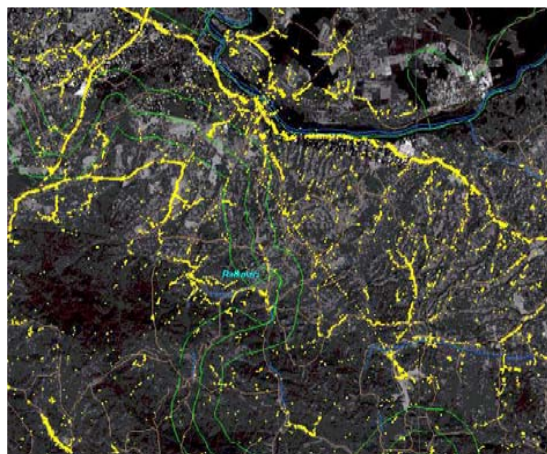
- Future E-8 (with MP-RTIP Actively Electronically Scanned Antenna) will dramatically improve Ground and Air Commanders' awareness
 - Dismounted Forces
 - Cruise Missile and low flying aircraft

MP-RTIP on Joint Stars – Expanding Precise Awareness of Surface Action

Current E-8



E-8 w/MP-RTIP



Improved Resolution &
Track Quantities / Continuity

Operational Benefit	E-8 w/APY-7	E-8 w/MP-RTIP
Wide Area Continuous Tracking	Red	Blue
Small Area Tracking	Green	Blue
Precision Engagement of Moving Targets	Green	Blue
Moving Target ID	Yellow	Green
SAR Image Resolution	Green	Blue
Concurrent SAR/GMTI	Red	Blue

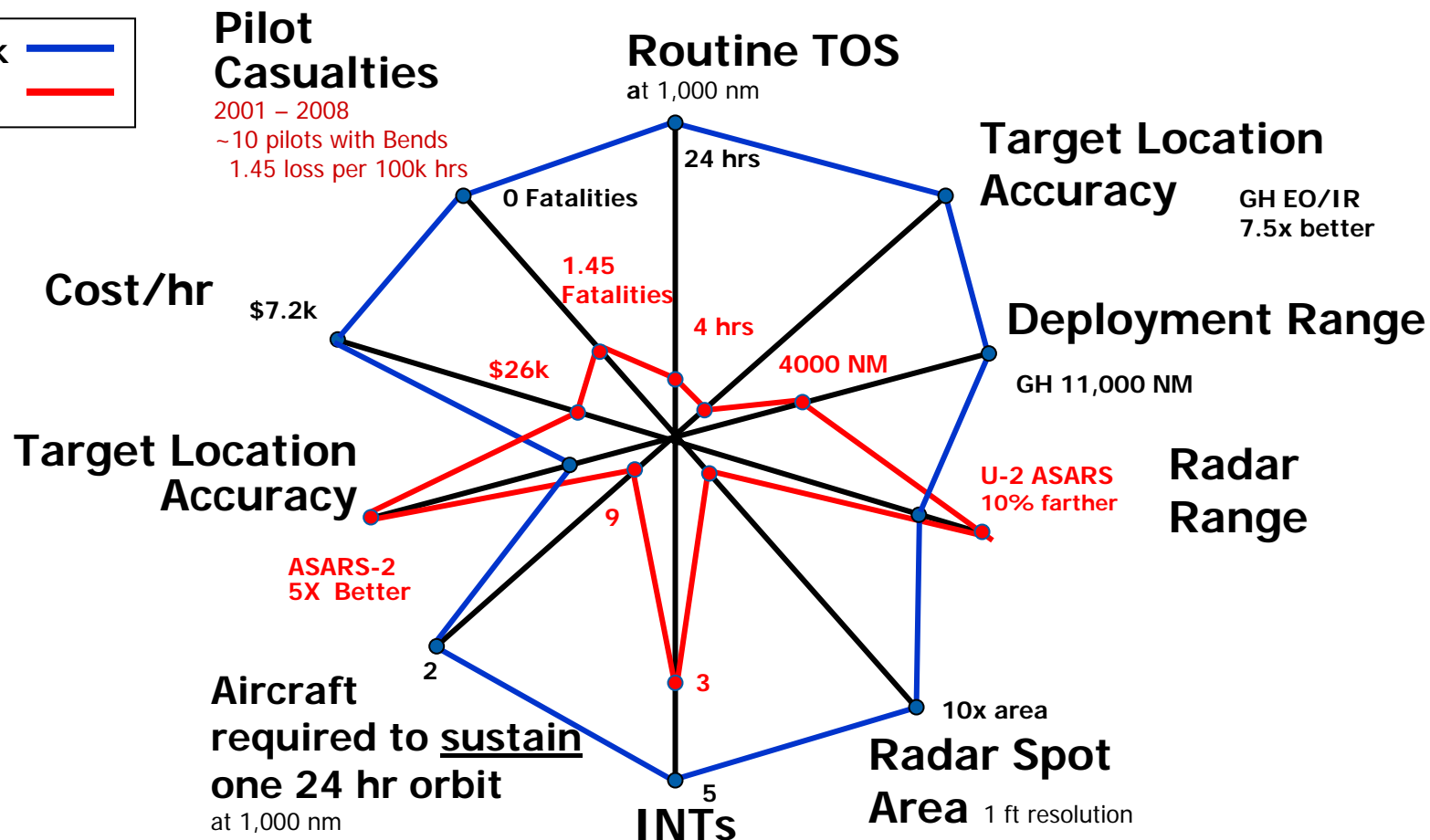
1991 – Move and Die
Stationary and Survive
2015 – Move and Die
Stationary and Die

Expanding the ISR coverage – Global Hawk

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System Comparison – GH vs U-2



Challenge of Precision Strike demands expanded
information collection

Unmanned Combat Air System (UCAS)

– Next Generation Combat System



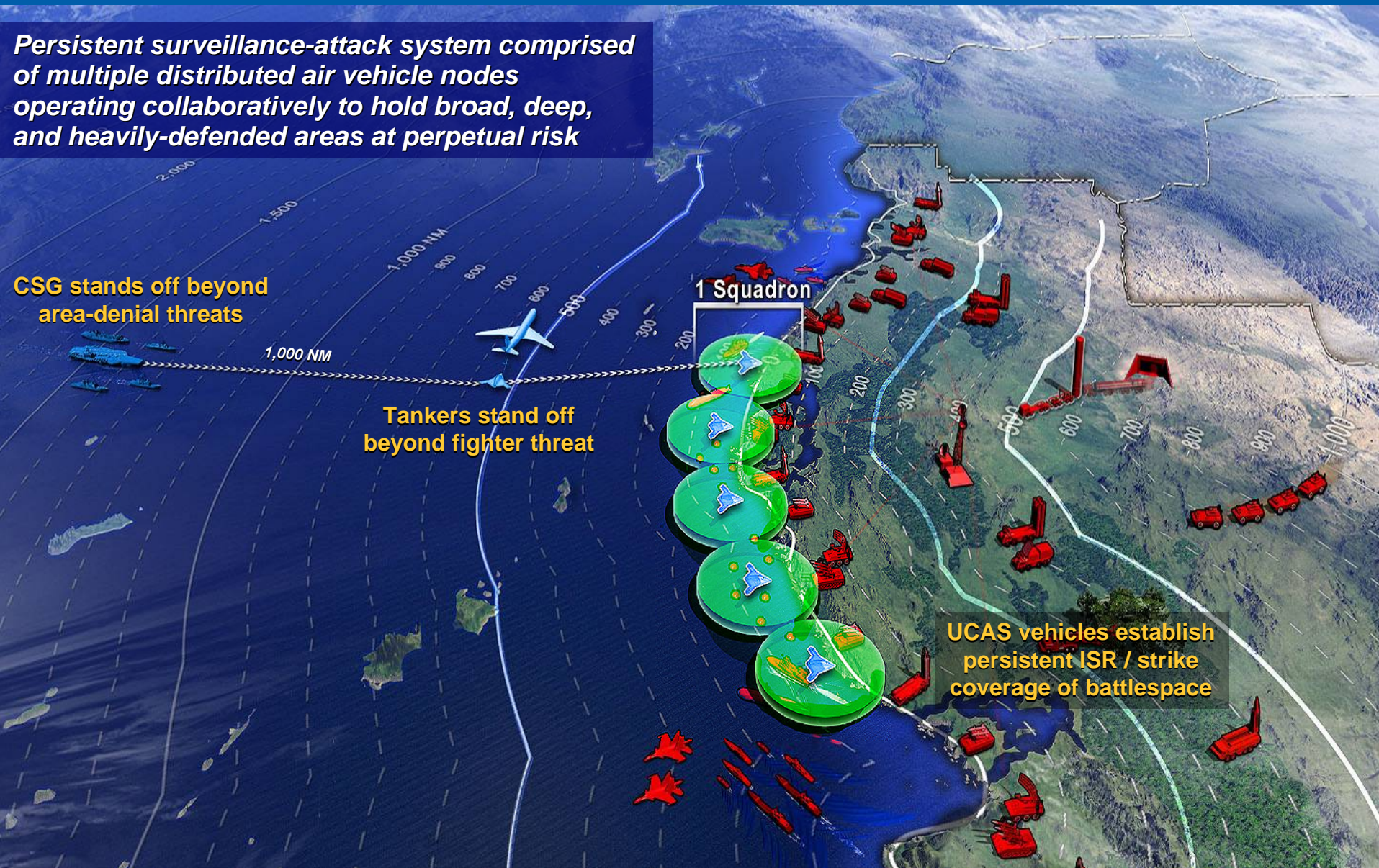
- Carrier based stealth UAS supported by autonomous air-to-air refueling (AAR) capability
 - Return of true global strike / ISR capability to the US Navy Carrier force
- Long unrefueled range / endurance for deep persistent operations
 - ~1,700-4,000NM max unrefueled range with current engines
 - ~3,300-5,600NM max unrefueled range with advanced commercial derivative engines
- Ultra-long refueled endurance for global responsiveness, extended CV standoff with AAR
 - >100 hours, limited primarily by actuators, lube oil
 - Probe-drogue and boom-receptacle refueling
- Balanced survivability
 - Broad-band / all-aspect stealth
 - On- and off-board threat awareness
 - Dynamic mission management / auto-routing
 - LPI/LPD communications
 - Electronic and lethal countermeasures
 - Collaborative defensive operations
- Advanced, networked targeting capability
 - Automated sensor fusion
 - Automated target recognition
 - Automated precision imagery geo-registration
 - GIG connectivity for ISR data distribution / receipt



UCAS in Action

– Survivable, Sustained ISR and Attack

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Persistent surveillance-attack system comprised of multiple distributed air vehicle nodes operating collaboratively to hold broad, deep, and heavily-defended areas at perpetual risk

CSG stands off beyond area-denial threats

Tankers stand off beyond fighter threat

1 Squadron

UCAS vehicles establish persistent ISR / strike coverage of battlespace

Surveillance and Attack Response

– Any Threat Environment



■ Multi-sensor ISR capability

- EO/IR,IRST
- SAR, Ground / Air / Maritime MTI, ISAR
- ESM

■ Advanced lethality

- Two internal weapons bays each carry up to 2,250 lbs of ordnance or advanced mission loads
- Up to 18 250-lb GPS-guided Small Diameter Bomb, or 2 2000 lbs JDAM)
- Miniaturized precision kinetic weapons (free-fall, glide and powered) to deepen strike magazine
- DE weapons for counter-air / missile ops

Potential N-UCAS Concepts of Employment

– Core Applications Offer True Multi-mission Capability

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Potential N-UCAS Concepts of Employment

– Core Applications Offer True Multi-mission Capability

NORTHROP GRUMMAN



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Potential N-UCAS Concepts of Employment

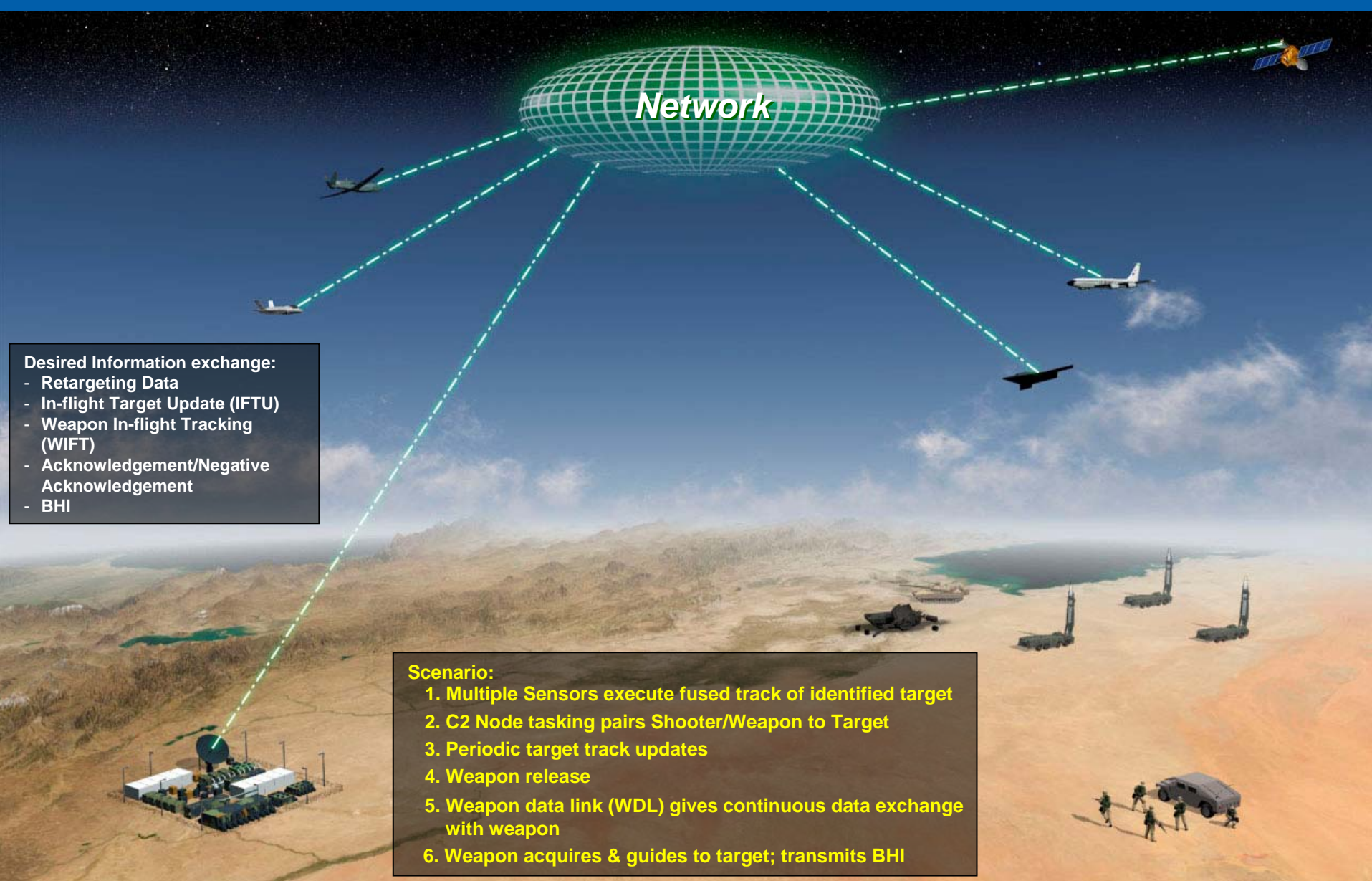
– Core Applications Offer True Multi-mission Capability

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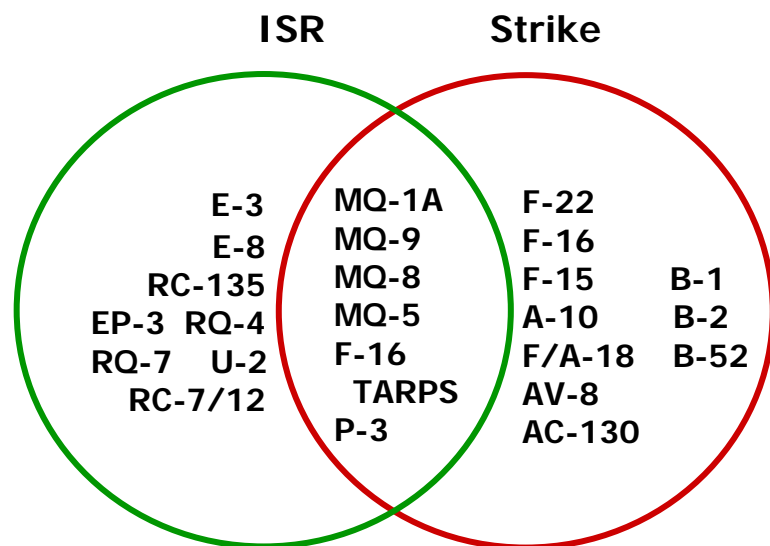


Precision Intelligence and Strike – Integrating Systems, 2015

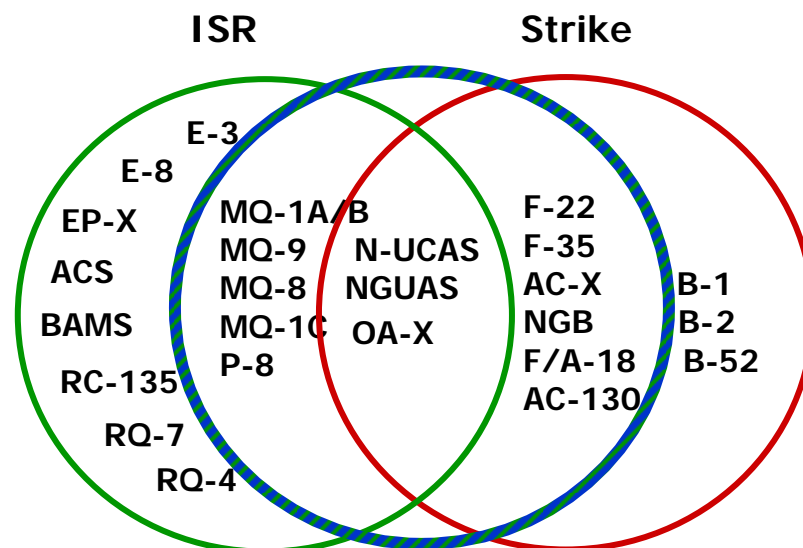
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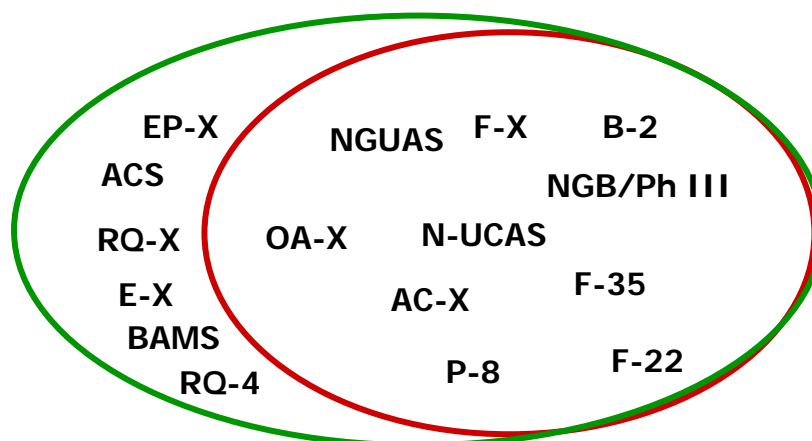
The Evolution of ISR and Strike



2010



2020



2035 Blend

- New Administration dedicated to prevailing in current fight by adapting capabilities for this mission ...
- ... while preparing for future challenges by building new capabilities
- Precision Strike in current and future scenarios demands a higher fidelity of Precision Intelligence
- Near-term and developmental systems offer significant improvements of the quality and quantity of data provided ...
- ... and will offers weapon systems that merge collection and engagement capabilities

Industry can no longer think of Precision Strike and ISR as distinct ...
as the Joint Warfighter does not

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